Electrical World

AUGUST 26, 1939

SURGE PROTECTION BY PETERSEN COILS

.000002 ampere power plants...

...for this ultra-sensitive WESTON relay

WESTON Model 705 Sensitrol

The most sensitive direct acting relay known handling 5 watts at 110 volts on its magnetic contacts... operates direct from photocells, thermocouples, resistance bulbs and electronic circuits... fixed or adjustable contacts ... provides positive control at energy levels as low as 1 millivolt or 2 microamperes... made in hand reset and solenoid reset types.

OTHER WESTON RELAYS

SENSITIVE RELAYS (Model 30) Permanent magnet, movable coil operation ... for circuits up to 200 milliamperes, 6 volts, DC... in types for "high-low" voltage (or current) control, and for regulation of voltage (or current) within 1%. Also "microampere" type, operating from high-side to low-side at a minimum differential of 15 microamperes.

SENSITIVE RELAYS (Model 534) Compact, permanent magnet, movable coil operation... for circuits up to 200 milliamperes, 6 volts, DC... for surface or flush mounting in current relay, voltage relay or "microampere" types.

TIME DELAY RELAYS (Model 613) Compensated bi-metal operation... single or double circuit... provides time delay of 15 seconds to 1 minute between initial impulse and operation... handles up to 25 watts at 110-volts output.

SENSITIVE INDICATING RELAYS (Model 730) Designed specifically for alarm circuit use where current is normally held at 2 milliamperes... standard model serves as indicator over 0-4 milliampere range, with contacts at 1 and 3 milliamperes... compact and inexpensive.

POWER RELAYS (Model 630) Electro-magnetic type with one to four mercury switch contacts... designed particularly for use with sensitive relays to supply output energy up to 1000 watts... operate on 6 volts DC, or from transformer rectifier unit.

Even though there is only a bare 2 microamperes of energy available, WESTON Sensitrol Relays, with indicating scales, can put it to work as a means of positive control. Similarly, if high speed high output or some other critical element is the limiting factor, there are other WESTON relays which exactly meet each requirement. » » » Whether your problem involves the application of sensitive relays to new products, or for existing circuits, the same WESTON engineers responsible for the widespread use of such relays as a means of dependable and flexible electrical control, are still at your service. Their counsel may bring to light many new possibilities. Feel free to call on them for assistance, or, write for the WESTON Relay Catalog. Weston Electrical Instrument Corp., 578 Frelinghuysen Ave., Newark, N. J.

WESTON *Instruments*

A Day to Remember

On Tuesday, August 15, 1939, formal transfer of Commonwealth & Southern properties in Tennessee was made to the Tennessee Valley Authority and to local governments associated with it in the purchase. The occasion was significant. It signaled the completion of a long forward step in the establishment of a regimented economy in the American scene.

Accepting the checks in payment to Commonwealth & Southern, its president, Wendell L. Willkie, said: "This transaction has demonstrated that no business, however well run, can endure against the competition of the federal government, with its vast financial resources. But the loss of these properties will not be in vain if it serves to arouse the American people against government invasion of their business."

Mr. Willkie knew well as he spoke that the "loss of these properties" will be in vain, that "to arouse the American people against governmental invasion of their business" this defeat will have little or no effect, unless private enterprise proves by works that it is capable of restoring the national economy to a higher plane. And, just as important, private enterprise must give the proof of its capability to the people and be certain that the people accept it as truth.

On the same day, but in another place and in a happier occasion, a press preview of the 1940 models of Studebaker automobiles, Samuel B. Pettingill, former Indiana congressman, carried Mr. Willkie's thought to its logical conclusion. He said: "It is not enough to condemn alien philosophies. We must make our own system work. Whether government helps or hinders, it is still the responsibility of business to sell more goods to more people. This, in turn, puts more men to work, buys more raw materials, increases payrolls, decreases relief rolls and reduces taxes."

The TVA principle is an actual threat to the electric utilities. It is also a threat to every form of private enterprise, perhaps only potential now, but possible of translation into form and substance with appalling quickness. Therefore it is not just the electric utilities alone that should risk the danger of active opposition and stand against attack. Beside and behind the utilities must be massed the whole weight of private business and the personal convictions of men and women who treasure freedom.

If the electric utilities, if all forms of private business, if all sincere believers in the American way of life are of a mind to undertake, understandingly and vigorously, the twofold task of reclaiming prosperity and of assuring that they get the credit for doing so, then the extension of government intrusion into the field of private business will have short shrift at the hands of the people. Then Tuesday, August 15, 1939, can be remembered as a day of defeat from which came the will to victory. But if the utilities, if business in general, if thinking people just go on, hoping for the best, hoping that somehow a miracle will happen, then that fateful Tuesday had better be forgotten among the many unhappy days that have come and gone in our recent history.

Telemeter Steam and Electricity on Indianapolis System

Effective balancing of industrial steam load with steam requirements for generation demands indication of both quantities at dispatcher's office — Describes the system used and gives reasons for its selection

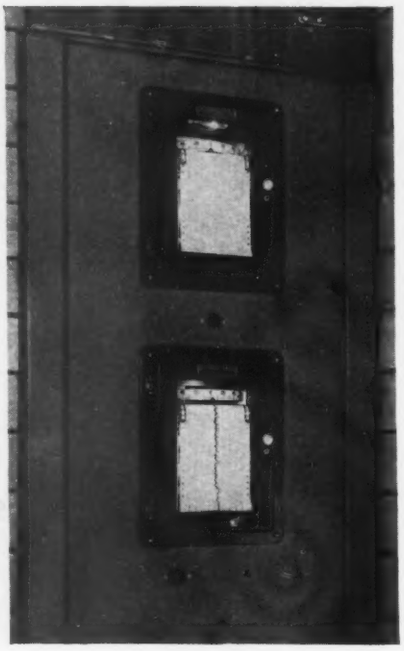
T. W. AYTON, *Planning Engineer Indianapolis Power & Light Company, Indianapolis, Ind.*

IN COMMON with most other electrical utilities, the Indianapolis Power & Light Company has long recognized the advantages of long-distance metering of the power measured at generating plants, substations and on important circuits. Plans for a telemetering installation reached fruition in 1938, when the engineering on the telemetering installation was completed, the orders placed and most of the equipment installed. The purpose here is to show why the installation of a telemetering system was of immediate importance, why the particular types of telemetering equipment were selected and to describe briefly these methods of totalizing and telemetering electric power and steam flow. This metering system is proving its value by providing closer supervision, improved regulation and distribution of plant capacity, as well as providing continuous operating records, which have often been of historical significance.

Certain more or less unusual conditions exist at Indianapolis which make telemetering of signal importance. These unusual conditions involve the dispatching of industrial steam as well as electricity:

The recently rebuilt C. C. Perry plant is divided into two sections, Perry W and Perry K, which are approximately ½ mile apart. The steam headers of these two sections are connected by a 20-in. underground steam main. Several industrial customers are served with high-pressure steam from this main. Two of these customers operate turbo-generators from this steam supply and use the exhaust steam from these units for processing and heating. The generators in these industrial plants are connected to the 4,100-volt distribution system of the company. We have another large industrial customer operating steam turbines from a second steam main connected to the Perry K plant 250-lb. header.

Section Perry W of the C. C. Perry plant has generating capacity consisting of two non-condensing units and one condensing unit. The two first units exhaust into a low-pressure steam heating main which feeds the business section of Indianapolis.



Power and reactive receivers at Harding Street plant on Lenore tie line

In addition, pressure reducer valves on the 250-lb. steam header at Mill Street plant feed a low-pressure steam main which supplies steam heat for a residence and apartment house district north of the business area. Similar pressure-reducing valves at the Perry K section of the C. C. Perry plant feed a distribution system that supplements and ties in with the low-pressure steam of the Perry W section.

We have two remote-pressure meters on the low-pressure steam heat mains, the primary element of each located at a point near the center of the distribution area; the remote indications of these meters are received at the Mill Street plant and at the Perry W section of the C. C. Perry plant. One of these transmitting units is shown in an accompanying illustration.

The Perry K section of the C. C. Perry plant consists of two new 650-lb. boilers feeding a 12,500-kw. topping unit and a 5,000-kw. house turbine. A 250-lb. steam header is supplied from a group of ten 250-lb. steam boilers. The exhaust from the topping unit feeds into the 250-lb. steam header. Two condensing turbines in this plant and several industrial steam mains are fed from this 250-lb. header.

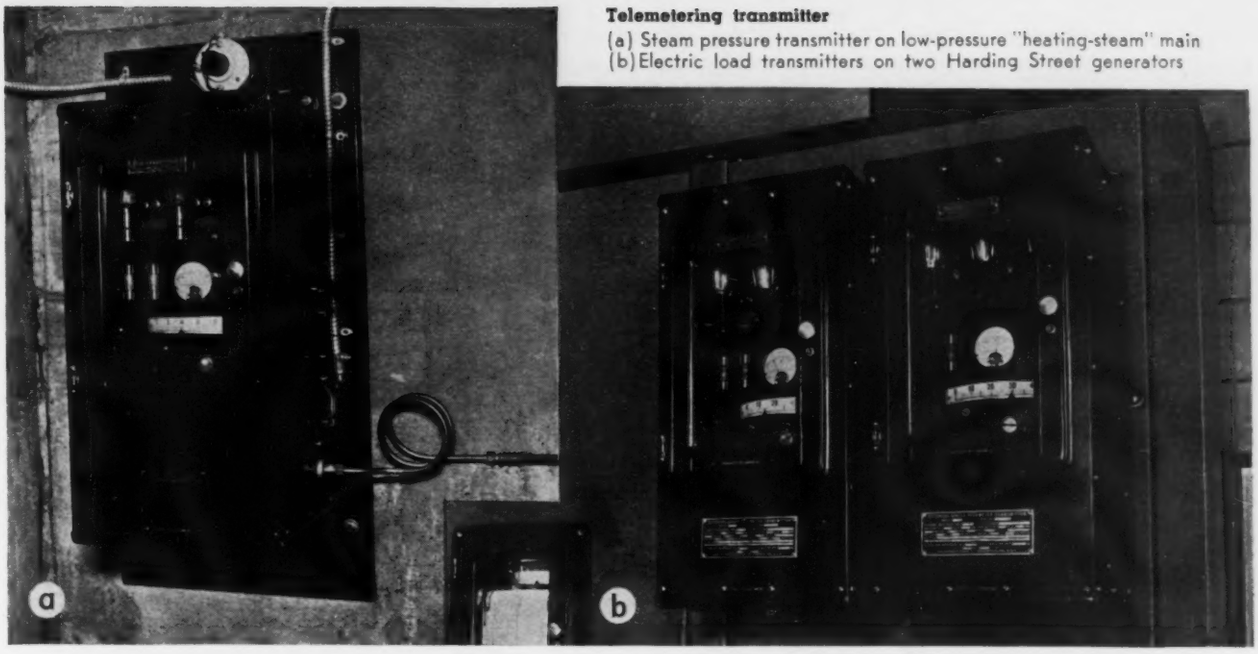
A close interrelationship of electric and steam generation and distribution problems exists in this system. This makes it desirable to have at the load dispatcher's office remote indications of both steam and electric quantities in order to obtain efficient and successful operation of this dual distribution system. *Normally the electric power generated at Perry W is a function of the steam heat load and is useful electrical energy obtained while reducing steam to the desired pressure. The amount of power generated by the two condensing units at Perry K depends upon the quantity of steam available from the boilers in operation, after serving the several industrial steam and heating mains.*

Engineering Features

Telemetering equipment is available from several manufacturers. These operate on different principles and are made for measuring various quantities. A number of such methods were studied, detailed information was secured from three manufacturers and actual physical and electrical tests were made on two of the recommended systems.

The points given consideration in these studies and tests were (1) reliability of operation, (2) speed of response, (3) accuracy, (4) maintenance, and (5) cost:

1. Our experience with two Esterline-Angus telemetering instruments in use on our Lenore tie line for approximately eight years proved that these instruments are reliable and

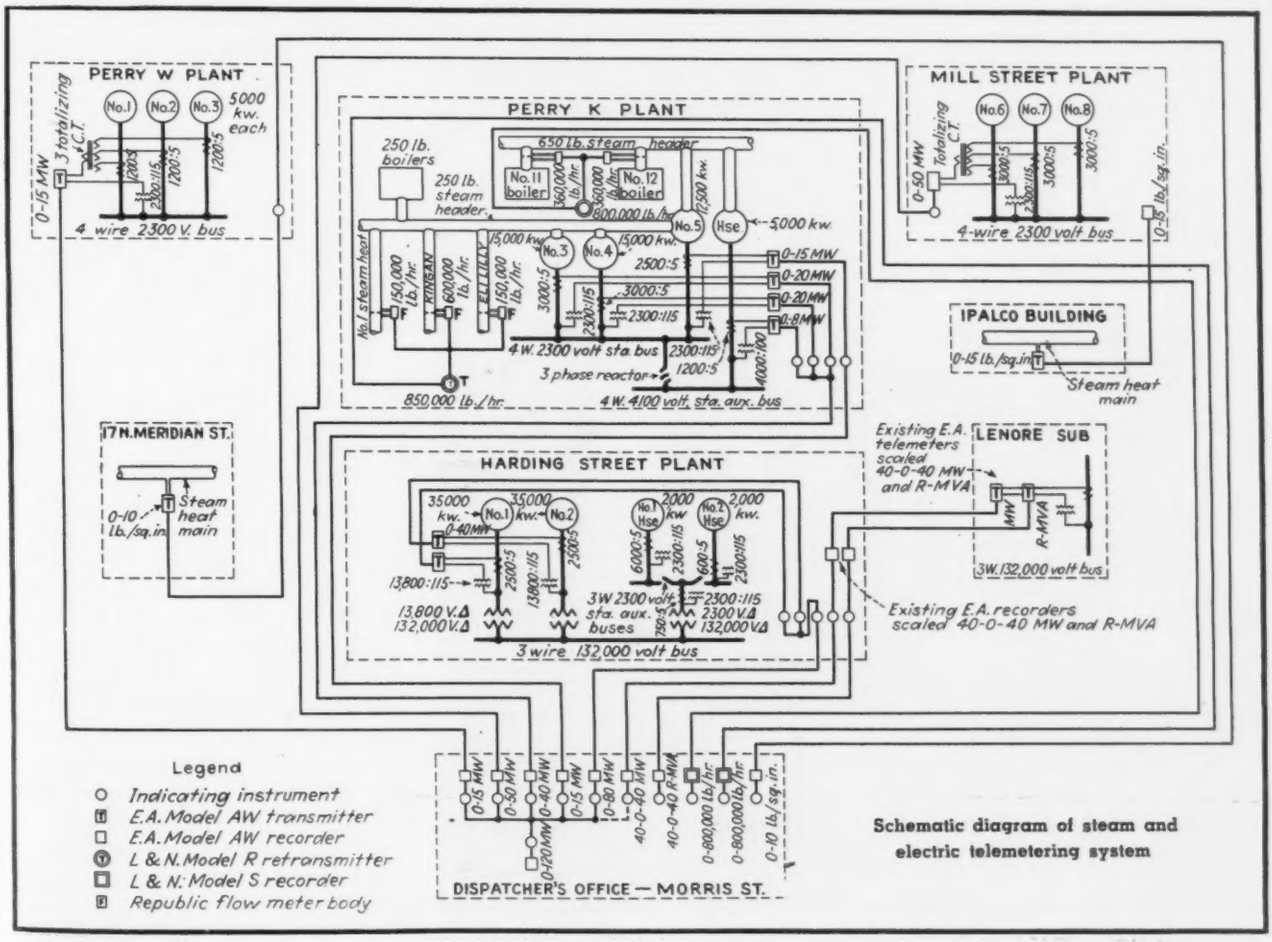


Telemetering transmitter
(a) Steam pressure transmitter on low-pressure "heating-steam" main
(b) Electric load transmitters on two Harding Street generators

have a low maintenance cost. The minimum number of moving parts, the simplicity of the device and the high factors of safety used in the design enabled these instruments to ride through disturbances that would cripple less rugged instruments.

2. One of the desired results of this telemetering system was an accurate record of power surges during times of system disturbances. This is a function of speed of response of the instrument. The instrument selected has a maximum speed of response almost twenty times as great as the other instrument tested. This characteristic, however, may be varied over a wide range.

3. Although the advertising literature gave a slightly higher accuracy to the other telemeter we tested, the actual operating tests we made on the two makes showed the telemeter selected to have higher accuracy.


PERRY W PLANT
PERRY K PLANT
MILL STREET PLANT
IPALCO BUILDING
17 N. MERIDIAN ST.
HARDING STREET PLANT
LENORE SUB
DISPATCHER'S OFFICE — MORRIS ST.
4 wire 2300 V. bus
4 W. 2300 volt sta. bus
4 W. 4100 volt sta. aux. bus
4-wire 2300 volt bus
3 wire 132,000 volt bus
3W 132,000 volt bus
Steam heat main
Existing E.A. telemeters scaled 40-0-40 MW and R-MVA
Existing E.A. recorders scaled 40-0-40 MW and R-MVA
Legend
Indicating instrument
E.A. Model AW transmitter
E.A. Model AW recorder
L & N. Model R retransmitter
L & N. Model S recorder
Republic flow meter body

Schematic diagram of steam and electric telemetering system

4. A comparison of maintenance on equipment made by the two manufacturers, and in use by this company, was favorable to the Esterline-Angus instruments.

5. The telemetering system chosen was the lowest in cost of any considered for our application. Our experience has shown that the maintenance on this type of equipment is practically negligible. In addition, the annual chart, ink and leased wire expense was less than that of the other systems considered.

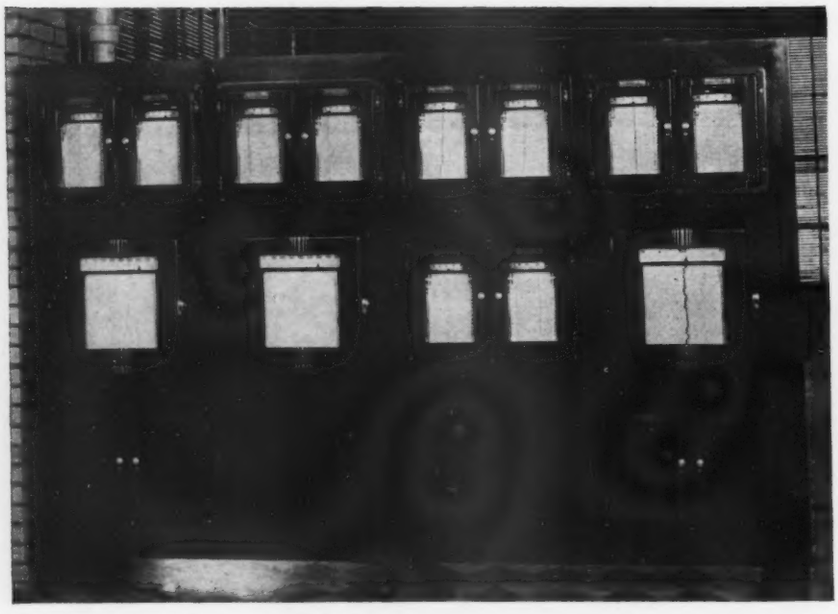
Operation of the Telemeter

The Esterline-Angus telemetering system consists essentially of two units, a transmitter located at the point where the measurements are made and a receiver located at a distant point. The receiver may be an indicating, contact making or recording instrument. The transmitter delivers a small direct current which is proportional to the mechanical position of the primary element, and the receiver is simply a direct current milliammeter, which reads the value of this current.

The speed of this telemetering system depends on several factors, as follows: Speed of the primary element, speed of the transmitting milliammeter, proportioning of the electrical delay circuit and the speed of the recorder. In practice, the electrical delay circuit determines the speed of the entire device. The speed of response is also affected to some extent by the resistance of the circuit over which the instrument operates. The entire device can be adjusted to cross scale in as little as one second, although for most purposes a speed of about three seconds is best.

In our particular application, since these meters were used to measure the power output of several stations, the possibility of totalization presented itself. Such load totalization may be done in one of two ways: First, by adjusting the transmitters so that each unit of transmitted current from each of the transmitters represents the same quantity of electrical energy, and then paralleling these currents through a single recorder; second, by transmitting a uniform quantity of current from each of the transmitters and performing the proportioning operation by an Ayrton shunt, before parallelling the individual circuits through a single recorder. Both methods were considered, and the latter chosen, since it provided a complete interchangeability of instruments. The shunt was constructed of copper wire, so that it would have the same temperature coefficient as the totalizing meter, and thus would be unaffected by ordinary temperature changes.

Any common-current telemetering system may be totally disabled by two or more simultaneous grounds on the connecting wire system. In order to provide maximum continuity to this installation, we provided small switches under each recorder, which may be used in case of trouble to disconnect any particular line from the totalizing recorder and thus prevent a faulty line from affecting the other measurements.



Steam and electric telemetering cubicle at dispatcher's office

Steam Flow Telemeter

We investigated the limited field of steam flow telemeters and then decided to introduce a new method for the telemetering of steam flow. Through co-operation with the Leeds & Northrup Company and Republic Flow Meters Company a simple and reliable system was developed to meet our requirements.

In the Republic "Flow Meter" system which we selected the pressure differential across an orifice is imposed on a body of mercury, this pressure being applied through incompressible water and oil seals. The differential pressure causes the mercury to rise in a chamber which is fitted with 91 stainless steel contact rods so placed that for each 1 per cent change in flow between 10 and 100 of rated flow the mercury will contact an additional rod. Thus as the steam flow rate increases or decreases the differential pressure across the orifice likewise increases or decreases, the mercury rises or falls in the contact chamber and makes contact with a greater or lesser number of the contact rods. Attached to each one of these rods is a resistance unit, these resistances being so proportioned that as the mercury rises and contacts successive rods the total conductance of the circuit will be proportional to flow rate being measured. A standard meter body has resistances of 400 and 40 ohms respectively at 10 and 100 per cent of rated flow.

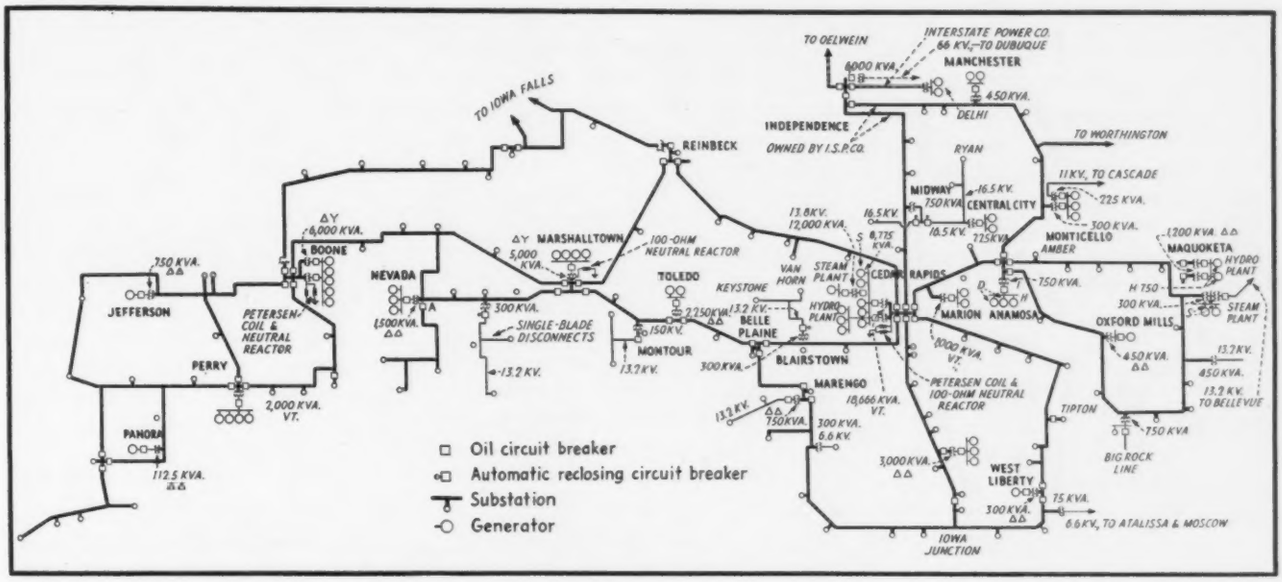
Steam lines having similar flow rates and therefore equipped with orifices having same capacities are thus totalized by connecting two similar meter bodies having similar electrical units, in parallel, and then measuring their combined conductance. This measurement is made with a Leeds & Northrup type R "Micromax" instrument. Steam lines having widely differing flow rates, and therefore requiring orifices of different capacities, are totalized by arranging the meter bodies and the resistance units so that each unit produces the same conductance in ohms for a given flow rate in pounds per hour, just as the output of the electrical transmitters described in the preceding section can be totalized if

[*Continued on page 94*]

Petersen Coils Protect Iowa System

Reduce outages and phase short circuits—Three coils with modern relays increase the service reliability—Installation and tuning of coils

A. B. HIRD* and H. H. BROWN,* *Iowa Electric Light & Power Company, Cedar Rapids*



Petersen coils are located at Cedar Rapids, Boone and Iowa Falls

THE transmission system of the Iowa Electric Light & Power Company is not, in a strict sense, a transmission system, but it is a 33-kv. distribution system with several sources of power, supplying an interconnected system to which numerous step-down substations are connected. The 33-kv. system of the Central States Electric Company is connected to and operated as part of the entire connected system. This connection consists of a loop, Reinbeck, Iowa Falls to Eldora, with a generating station at Iowa Falls.

Disturbances of a transitory or permanent nature resulted in a service interruption on the sections of the system between breakers protecting the section in which the disturbance occurred. Due to the relatively light construction and high fault currents a large percentage of the faults caused insulator destruction or conductor burn-downs, resulting in a permanent outage until the fault section was isolated.

These conditions dictated a study of system operation in 1935. This study revealed that on approximately 900 miles of 33-kv. line there were 494 disturbances in which one or more breakers were opened by relay action. In 251 cases the only relays to operate were ground relays. In 55 other cases the faults probably originated with a line-to-ground fault, making a total of 306 interruptions, or 63 per cent of the total, originating as ground faults. Approximately 85 per cent of these faults were of momentary duration, indicating that the trouble was due to an arc. On this basis 260, or more than 50 per cent of all faults actually causing relay operation, were ground faults or originated as ground faults. The result of these data indicated an investigation of the insulation values of the system.

The line construction of the system varies, but the majority of the supporting structures are wood poles. A large percentage of the wood poles were grounded either with ground wires on each pole or grounded guy fixtures, also a small portion of the supporting structures were grounded steel towers. With the existing situation the possibility of reducing the interruption frequency by use of the Petersen coil method of protection was indicated.

In considering the application of the Petersen coils the following factors were taken into consideration:

1. *System Insulation to Ground*—In case of a solid grounded system the ground connection is made through the Petersen coil only and insulation levels of all apparatus must be provided to withstand full-phase voltage to ground. An investigation of all equipment, line insulators, bus insulators, transformers and breaker bushings, arresters and transformer coils insulation was made. It was determined that, with few exceptions, all insulation was sufficient

*Abstract of paper, Missouri Valley Electric Association.

to withstand full-phase voltage to ground when Petersen coil grounding was installed.

2. *System Charging Current*—The charging current on a system is not subject to precise calculation. Experience has shown that the results of calculations of a 33-kv. system should be used with caution, as measurements have given values as high as 50 per cent above computed figures, particularly on medium-voltage lines.

The charging current of the system was determined by ammeter measurements at the Boone power station by isolating a section of the system. With 154.5 miles of the system connected and the neutral of the section isolated the charging current measured was 32 amps. This is an average of 0.207 amp. per mile. An average value of 0.21 amp. per mile was used as a basis of design for the coils of the entire system. With more than 1,000 miles of 33-kv. system connected the capacity current of the system is between 200 and 250 amp.

3. *Manner of Operation*—The nature and extent of the 33-kv. system is such that at times sections of the systems may, during either normal or under abnormal conditions, be operated isolated from the rest. In such cases grounding protection would be required for the isolated sections. This operating condition dictated the installation of more than one coil.

This operating factor, combined with certain limitations of current tap ranges of the Petersen coil, resulted in a decision to install three coils, one each at the Cedar Rapids, Boone and Iowa Falls generating plants. These coil ratings were 40 to 100 amp. on the coils at Boone and Iowa Falls and 90 to 180 amp. at Cedar Rapids, the ratings being such that the tap range was of sufficient width to give the required protection to the connected system contiguous to and supplied by the three generating stations, under practically any condition of system operation.

Operating Records With and Without Petersen Coils

Months	1937 Grounds	1937 Outages	1937 Outages Due to Grounds	1938 Grounds	1938 Outages	1938 Outages Due to Grounds
May	59	60	44	186	43	7
June	115	54	38	191	50	10
July	54	76	46	334	92	28
August	120	71	45	331	67	28
Sept.	60	56	40	*232	*37	*22
Oct.	36	22	21	90	13	1
Nov.	20	22	10	85	13	6
Dec.	23	13	13	43	11	6
Totals	487	374	257	1,492	326	108

*Coils out of service for eight days.

Permanent Ground Faults

The function of Petersen coil protection is to eliminate interruptions due to ground relay operation on all transitory ground faults and is considered as a supplement to ground relays to prevent them from operating on all except permanent ground faults.

A small percentage of ground faults are the result of damage to or failure of system insulation and must be located and segregated from the rest of the system by oil circuit breakers. In order to clear such faults means must be provided for regrounding the system so that ground relays may function. Such provision is made by the installation of a single-pole switch in parallel with the coil, with control equipment which closes the switch after a ground fault has persisted for a predetermined period. Operating experience with Petersen coils indicates that approximately five seconds is sufficient time for a transitory ground fault to clear if it is going to be extinguished automatically.

If the ground fault is not extinguished automatically the relaying for the permanent ground fault is a simple procedure if only one coil is installed and only one point on the system is grounded. With more than one coil installed and a like number or more ground points on the network used, the relaying is more involved in order to secure selective operation of the ground relays. An exact method of timing is necessary to secure simultaneous closing of the short-circuiting switches in order to secure section selectivity of the ground relays. Several methods have been used to accomplish this result.

Coil Switch Timing

The method used on the Iowa Electric Light & Power Company's system to secure proper timing and selective operation of breakers on permanent ground faults is, briefly, as follows:

A current transformer in each Petersen coil, with the primary connected in the ground lead, has its secondary connected to an instantaneous overcurrent relay, operating on 0.5-amp. secondary current or 18 amp. primary Petersen coil ground current. This relay opens contacts in a 115-volt a.c. potential circuit connected to an induction type undervoltage relay, with a time setting of five seconds. This relay closes the tripping circuit of the spring-operated air-break switch, which short circuits the Petersen coil, thus grounding the system for ground relay operation. This method is used for the three Petersen coils at Cedar Rapids, Iowa Falls and Boone.

In addition to these three coil-grounding points it was necessary, in order to secure selective operation of ground relays at the Marshalltown generating station, to provide a natural ground at Marshalltown. This ground is provided by means of a Y-delta bank of transformers with the neutral ground open under normal operating conditions. Under persistent ground fault conditions this neutral point is grounded by the same timing method as used at the Petersen coil locations, with the exception that the timing period is instituted by voltage rather than current.

This voltage is secured by an instantaneous type overvoltage relay in one corner of the delta of the grounding transformers. Under normal conditions no potential exists across this relay. Under ground fault conditions voltage across the corner of the delta causes this relay to open contacts in a potential supply circuit of an induction undervoltage relay which takes five seconds to close its contacts, which in turn close the grounding switch, making the ground relays operative.

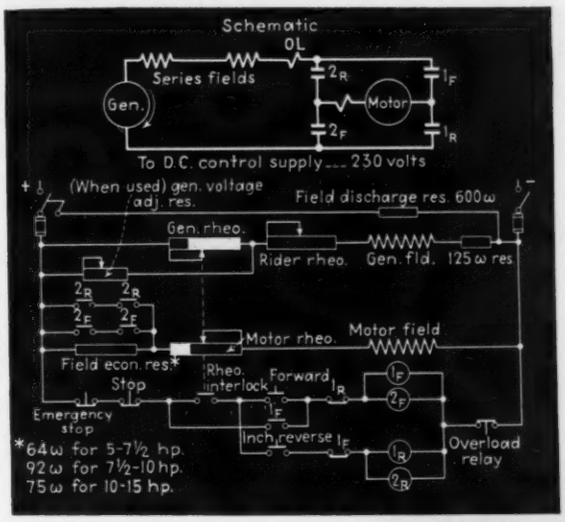
Petersen Coil Tuning

When a Petersen coil is installed on a system it is necessary to match the inductive reactance of the coil or coils with the capacitive reactance of the system. It is desirable that accurate setting be secured by actual tests. Such tests may be conducted during normal conditions (no conductor grounded) or with one conductor solidly grounded.

The tests on the Iowa Electric Light & Power Company's system were conducted with no conductors

[*Continued on page 94*]

Speed of Reel Drums Controlled Independently

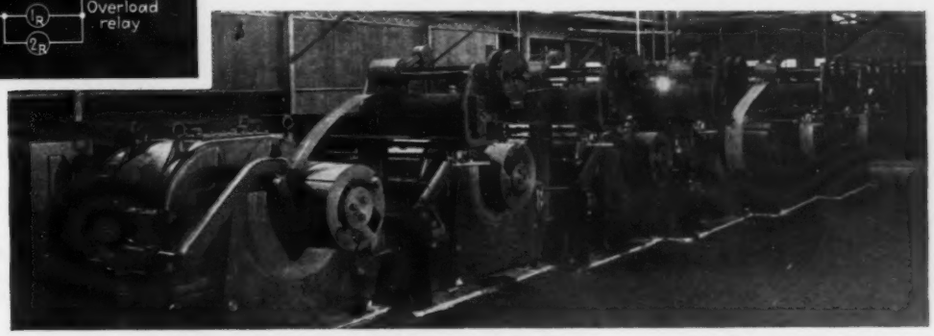


Schematic diagram for the variable-voltage cleaning line control

AS MANY as six coils may be drawn through a cleaning bath at independent speeds from 15 to 60 ft. per minute in this cleaning line at Superior Steel Corporation. Manual field control determines the speed of the Westinghouse gearmotors driving the reel drums.

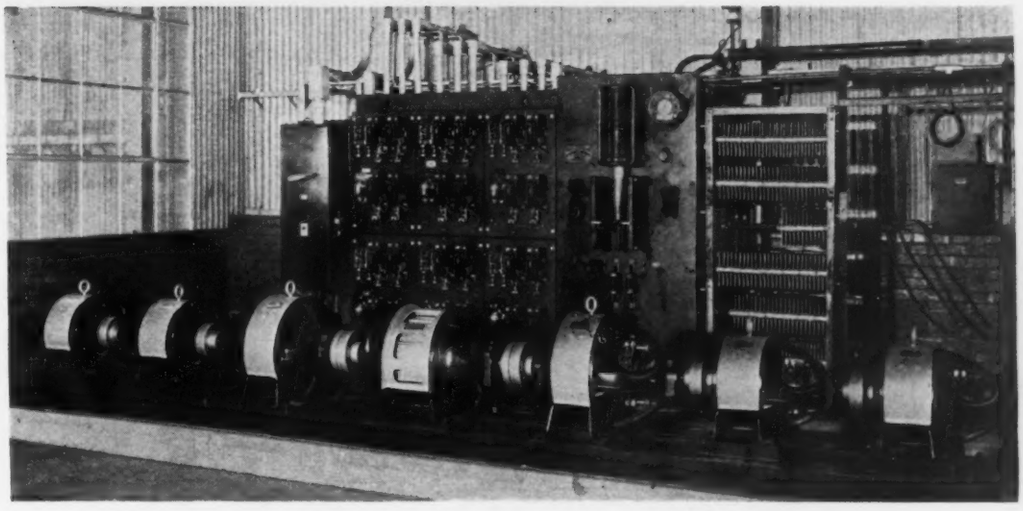
Change in linear speed as the coil builds up on the reel drum is compensated for by means of variable voltage applied to the gearmotor armature; a rider rheostat acting on the field of its particular generator controls it.

The gearmotor installation replaced a former one driven by motors coupled to speed reducers. It is reported to take up a minimum of space and to have involved low costs of installation and operation.



Gearmotor end of coil-winding equipment
Two 7½-, two 10- and two 15-hp. units make up this battery. Units have capacities of 2,000-, 4,000- and 6,000-lb. coils respectively. Sectors at each unit, on same shaft as roller arms in accompanying picture, rotate rheostat to strengthen generator fields as coil diameters increase.

Slow-speed end of coil-winding equipment
Reel drums of 20-in. diameter are mounted directly on each of the slow-speed shafts. Separate control stations are provided. Roller arms respond to increasing coil diameters and strengthen fields of gearmotors through strengthening fields of generators.



Motor-generator set for gearmotors
Common motor drives six Westinghouse generators, each serving one of the six gearmotors. Variable-voltage control and starter for set can be seen at the left.

Primary Network Proves Advantageous in Boston

Copper and losses reduced — High-tension breakers obviated— Voltage and service continuity good — Kw. and kw.-hr. division satisfactory — Is found adaptable to any rate of load growth

ST. GEORGE T. ARNOLD,* *Engineer Distribution Division, Boston Edison Company*

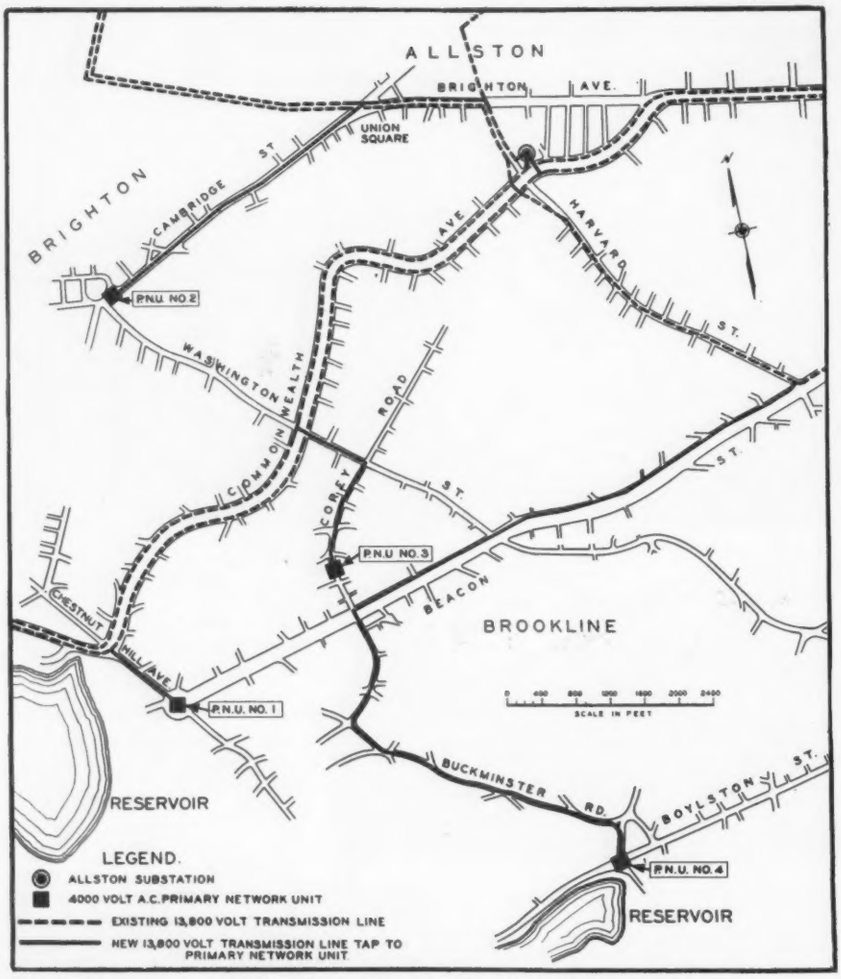


Fig. 1—Map showing location of primary network units in Boston suburban area

MUCH has been written in the last decade about the economic and operating advantages of the primary network. It is particularly well adapted for suburban load densities that are growing.

The Boston Edison Company installed in 1932-1934 a four-unit 13.8-kv. to 4.16/2.4-kv. network in the Brighton-Brookline area. Excellent service has resulted from these four 1,500-kva. transformer units and their tie circuits. The following operating features and economic advantages apply to all primary networks, but have particular reference to the experience of the Boston Edison Company with their four-unit network:

1. High-voltage, small-conductor feeders (13.8 to 33 kv.) are taken to the load centers; the long 4-kv. feeders are eliminated and substantial savings in copper loss and in 4-kv. copper conductors are realized.

2. No high-tension breakers are required on the high side of the network transformers. Each transformer is connected through a three-position manual switch to a different transmission line. The modern transformer has a negligible failure rate and there is little additional hazard in making it a part of the transmission line.

3. Automatic tap changing under load on the high side of the transformer gives excellent bus regulation. A rising voltage characteristic under load is obtained by proper setting of the compensating devices. Excellent voltage is maintained on the 4,160/2,400-volt network tie circuits, which have their single-phase loads balanced across the three phases and neutral.

4. The continuity of service rendered by the primary network is excellent. Most overhead primary trouble on the 4-kv. circuits and a large part of the phase-to-ground trouble in the underground cable are burned clear without a breaker operation. The two sources of supply can feed large values of current into a fault before the breakers lock themselves out. Time delay and two automatic reclosures are features of the breaker operation.

5. Load and kilowatt-hour division are all that could be desired among the four units of the network. Load may be shifted from one unit to another by varying the setting of the contact-making voltmeter. The fears of large circulating currents have not been realized. For high power factor loads inverse reactance compensation prevents circulating cur-

* Excerpted from paper "Some Principles and Practices of Modern Distribution Design; Suburban Load Densities," which was awarded third James H. McGraw award at recent E.E.I. convention.

rent. For low power factor loads resistance only should be put in the compensator of the miniature circuit and the contact-making voltmeter should be made more sluggish in its operation.

The network principle is adaptable to any rate of load growth. By installing the network units where the load actually exists immediate economy in loading the units can be realized. If the load does not develop or grow as expected the unit can be removed to another location and 100 per cent salvage realized from the equipment. The network principle calls for small increments of investment that are immediately used efficiently.

The accompanying cost comparison shows the superiority of the Brookline-Brighton four-unit network over several radial substations from an investment per actual peak kilowatt standpoint. The radial substations were built as modern substations between 1924 and 1930 and the four-unit network was built in 1932 (three units) and 1934 (one unit). The radial substations and the network units have about the same operating costs as they are all automatic in operation and require periodic inspections only. No street-lighting equipment is installed in the radial substations or in the network units. The radial stations were the most modern ones built by the Boston Edison Company without street-lighting equipment since 1924. The substations and the network step down 13,800 volts to 4,160/2,400 volts (in one case to 2,400 volts delta) for suburban and urban distribution.

Peak Kilowatt Cost Comparison

Radial Substation	Relayed Capacity Largest Transformer Out	Installed Transformer Capacity Mfr's Rating (Oil)	1938 Peak Kw.	Relative Investment Cost— Per 1938 Peak Kw.	Per Kva. of Installed Capacity
A	2,250	4,500 kva.	1,400 kw.	170 %	83 %
B	1,500	3,000 kva.	2,900 kw.	115 %	172 %
C	3,000	4,000 kva.	1,800 kw.	167 %	117 %
D	7,000	14,500 kva.	9,500 kw.	65 %	66.3%
E	3,500	7,000 kva.	2,800 kw.	137 %	85.5%
F	2,250	4,500 kva.	2,800 kw.	87.3%	83.8%
Average of six radial substations				100 %	100 %
Brookline-Brighton four unit network	4,500	6,000 kva.	6,130 kw.	59.6%	94.6%

The table shows that the network investment cost per 1938 peak kilowatt was 40.4 per cent less than the average of the six radial substations. Thus, the network was economically loaded soon after installation, which is a difficult thing to accomplish with a radial substation. The investment cost per installed kva. shows the network comparable to the radial stations. Four of the radial stations cost less and two cost more per installed kva. than the network.

It should be pointed out that the cyclic kva. ratings of the transformers in the above stations and network are considerably in excess of manufacturer's rating and that stations B, D, E and the network could be relieved of large amounts of load by adjacent stations in case of loss of a transformer.

Radial to Network for Economy

Station design engineers who find their high- and low-tension breakers inadequate for the increased interrupting duty, but find their transformers and regulators with several more years' useful life, should consider redesigning the station into two units of a primary network using the existing transformers and induction regulators and buying new low-tension breakers only. This idea finds its easiest application when two radial stations are changed over to primary network units at the same time.

Fig. 3 illustrates how two radial substations can conveniently, and with minimum expense, be changed to a four-unit network. The high-tension transformer breakers are omit-

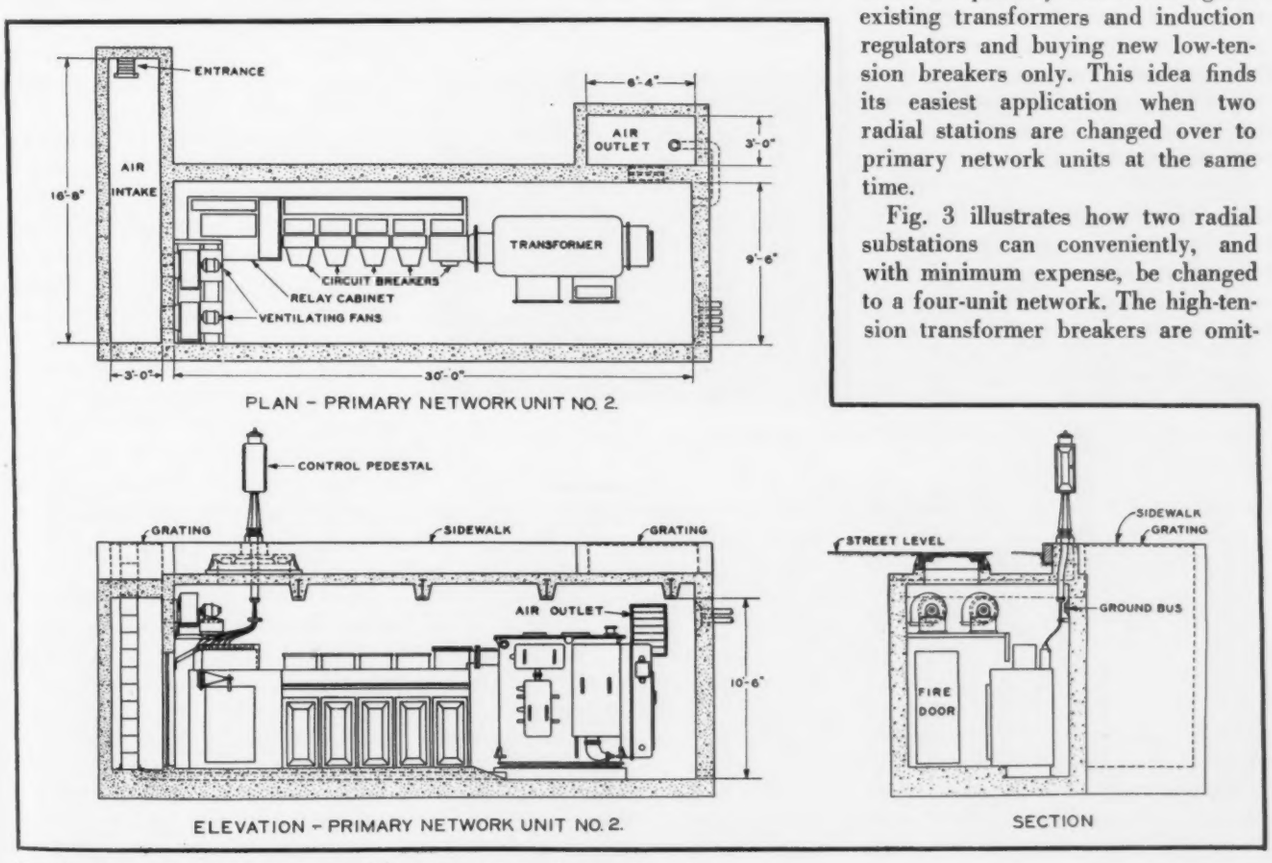


Fig. 2—Plan and elevations of network equipment in underground vaults

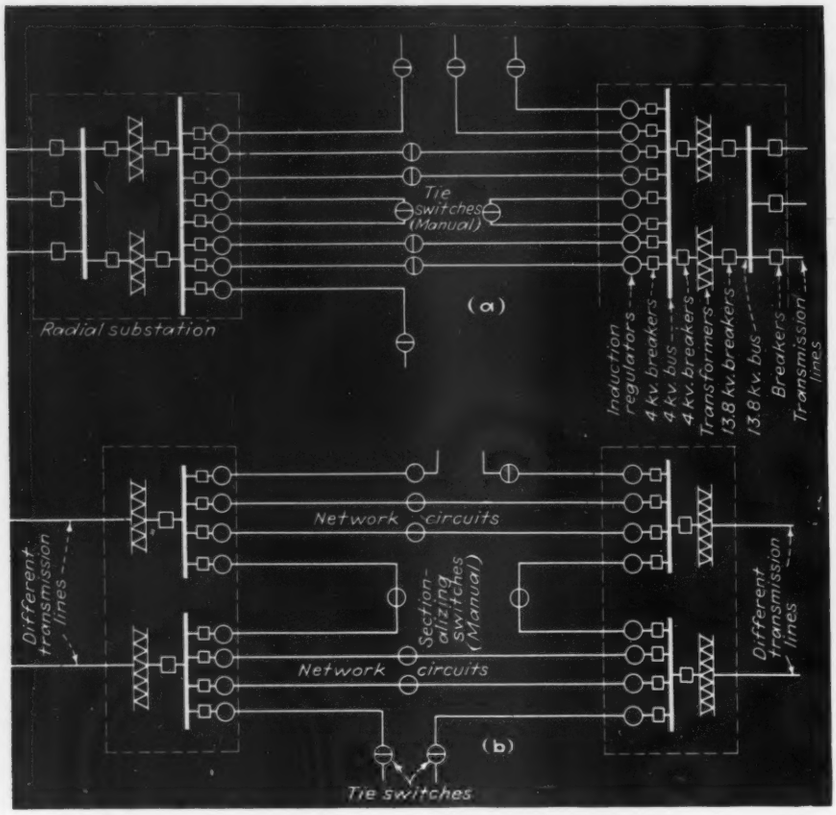


Fig. 3—Radial substations can be converted progressively into a medium voltage network

(a) In two existing radial substations circuit breakers have become inadequate to interrupt increasing short-circuit current. Transformers and regulators, however, have several years of useful life remaining. What to do?

(b) Each substation is changed to two units of a medium-voltage network. The 13.8-kv. breakers are omitted and new 4-kv. breakers have been installed. The former regulators and transformers are continued in service.

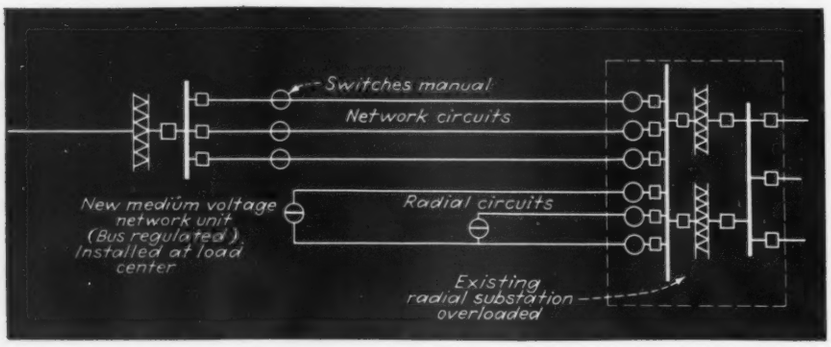

Switches manual
Network circuits
New medium voltage network unit (Bus regulated) installed at load center
Radial circuits
Existing radial substation overloaded

Fig. 4—Network unit tied together with radial substation to relieve the substation of overload

ted and a separate transmission line is connected to each transformer. Other transmission lines that previously came into the high-tension board are rerouted outside of the station. Each transformer supplies a new 4-kv. bus with four or five modern breakers installed. The existing single-phase induction regulators are connected to the four or five circuits which extend out from each of the 4-kv. board sections.

The network circuits with individual regulators may be any length between the network units. This is a decided advantage over bus regulation and permits a heavy load to be located some distance from either unit.

It is the author's opinion that network circuits with individual regulators can be made to operate satisfactorily with a resistance compensation in the miniature circuit only and the contact-making volt-meter set a little sluggish, requiring a 1½ to 2-volt change in voltage to close its contact. It is necessary, of course, that the transmission lines supplying the network transformers have little angular phase displacement in their supply voltage. The longer the 4-kv. circuits between transformer units the less serious is this angular displacement in voltage. It is best if the transmission lines supplying the transformers in a network have the same type of load cycle and power factor.

Network Gives Relief

In the diagram of Fig. 4 is shown schematically the method in which a single-unit network can relieve an overloaded radial substation. This is particularly applicable if the load growth has taken place at some distance from the substation. The growth of the load away from the station may require installation of additional transformer and circuit capacity in the existing substation and the extension of a distribution feeder to a growing load area, or a single-unit network can be installed at the load center by using existing distribution cable for two to four network feeders between the new unit and the radial substation. The latter plan will usually be the economic solution to the overload problem unless there is an excessive amount of transmission cable to install to supply the new network unit. The network unit installed at the growing load center is more flexible and adaptable to increasing load growth than the plan of enlarging the radial substation.

A cardinal principle of distribution design is that maximum use should be made of all serviceable plant. The network principle of adding increments of capacity when and where needed and tying in with the existing radial stations makes maximum use of the existing radial substations. A network circuit with three single-phase regulators at one source of feed and bus regulation at the other will operate satisfactorily.

Larger Network Units?

Most of the medium-voltage networks installed in this country at the present time have a 1,500-kva. transformer, a transformer breaker and four breakers for the network feeder circuits. The cyclic and emergency overload rating of the network transformer is considerably greater than 1,500 kva. Assuming 1,500 kva. on the transformer, we divide by

[*Continued on page 100*]

Sales Compensation With Three Objectives

Fixed income with incentive compensation based on salesman's accomplishment in load building, not in just selling, works out to satisfaction of dealer, company salesman and public

K. I. JACK, *Washington Water Power Company, Spokane*

WITH the far-sighted realization that a salesman's compensation plan is something more than merely a scheme for keeping the boys busy and the revenue coming in, Washington Water Power Company, Spokane, Wash., has adopted a new one. The thought and study that went into the preparation of the plan point up a lesson for every public enterprise—that what may seem to be a purely personal, within-the-company problem may, in reality, have many ramifications of deep significance in the field of public relations.

In essence, not very different from compensation plans recently adopted elsewhere, it is noteworthy for its thorough cognizance of local conditions, and especially for its recognition of good relations in three directions—with employees, with the industry, with the public.

Considering salesmen alone, Washington Water Power's motive is to guarantee a fixed income and still provide a direct incentive for production. Fixed-salary compensation, subject to $25-per-month increase or decrease every six months, is determined by a dual measure—E.A.R. accomplishment plus all-round performance, both for the preceding six-month period.

Accomplishment, based on the previous six months' sales, makes the salesman eligible for a salary change of one step in either direction in the following scale:

Salesman's Monthly Salary	E.A.R. Credited Previous Six Months
$125	$1,100
150	1,300
175	1,600
200	2,000
225	2,700
250	3,750

It is in the crediting of E.A.R. that careful consideration is given to the dealer's well-being. Lewis A. Lewis, assistant general manager, explains it this way:

> We want the dealers to know that our salesmen are not out to take business away from them, but rather to help them make sales. For this reason we give the salesman full E.A.R. credit for the sale of electric ranges, water heaters, stokers and oil burners by dealers to new users, whenever the prospect card shows the salesman was instrumental in causing the customer to purchase.

Under the same conditions, the salesman receives 50 per cent E.A.R. credit when the electric range or water heater sold by a dealer replaces similar equipment. Again, the credit is the same as it would be if the salesman made the sale through the company.

Thus E.A.R. value, as determined by the company's general sales department, is credited to the salesman on all new business he secures. Incidentally, in the case of an apartment house, full credit is allowed on the sale of electric ranges and water heaters up to and including four of each.

Under the plan salesmen are paid $75 per month for a six-month training period, then $100 per month for a year. If by this time their performance and E.A.R. accomplishment indicate they are properly located in sales work they are eligible for advancement to $125 per month and to the full provisions of the salary scale (which is based on the $125 minimum) thereafter.

It will be noticed that the foregoing measures of accomplishment make the salesman eligible for a raise. To get it, he must achieve a 75 per cent rating on performance. And this is where the third aspect of good relations enters in.

The salesman's ability to maintain good relations with the dealers and to make friends for the company with every prospective customer that he meets counts for 40 per cent of his total performance rating.

Each salesman's performance is graded each six months by the division manager and the division sales manager in collaboration with the assistant general manager in charge of sales. The salesman's performance is expressed in per cent, according to the factors which are given the following weights:

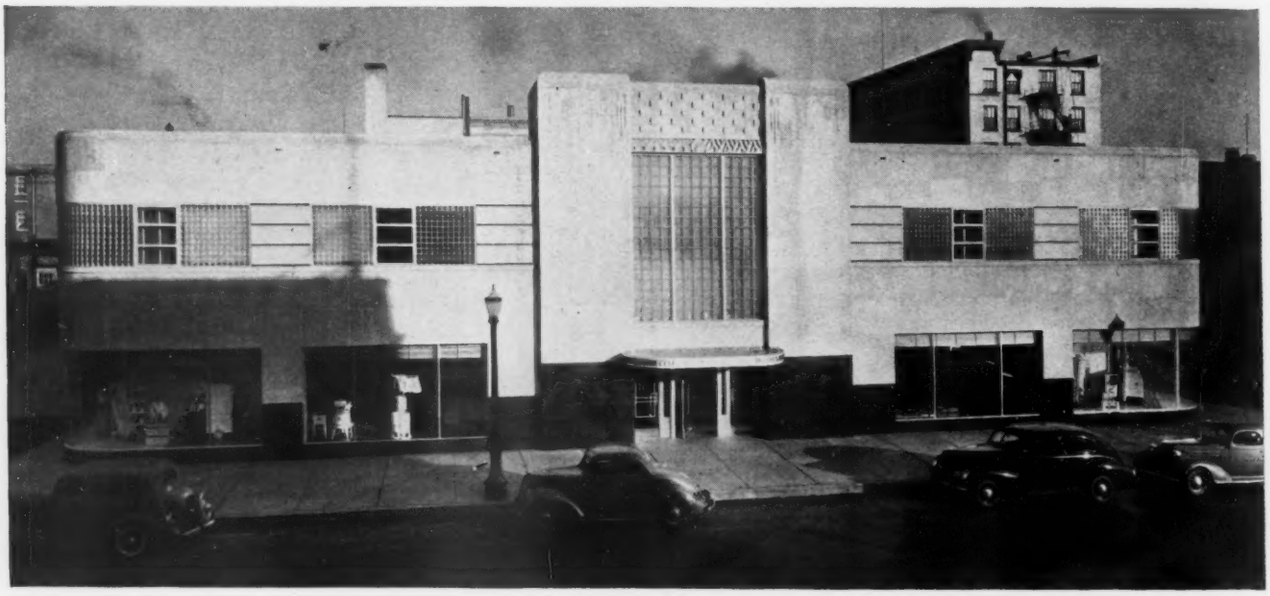
	Per Cent
1. Ability to make friends for the company from every customer contact	20
2. Ability to sell services and at the same time maintain good-dealer-relations	20
3. Spirit in which assignments by superiors are carried out	20
4. General conduct: Dependability, punctuality, resourcefulness, honesty, willingness, interest in work, attitude toward co-workers, personal appearance	20
5. Balanced load-building performance	15
6. Seniority (five years or more, full credit)	5

[*Continued on page 96*]

K. I. Jack

Peoples Power Erects Model Office Building

Simple architectural lines, contrasting stone facings and glass blocks give modern beauty to exterior—Inside are latest ideas in office and display space lighting



Main Entrance
Main facade is Kasota stone with black granite base. At night colored flood and spot lights controlled by flasher and color blend units behind the glass block panels produce various color combinations to give a sequence of colors in the order of the spectrum in a sunburst effect against amber blue and purple backgrounds. Gold fluorescent lights outline smaller second floor "window panels" at night.

Sales floor
Illumination is 55 ft.-candles on 120 x 40-ft. sales floor. Indirect units with 750 watt-bipost base lamps on 10-ft. centers hang from 15-ft. ceiling. Intensity built up to 110 ft.-candles on backed-up displays using 45 egg crate units with 300-watt lamps. Twenty-three 18-in. and ten 36-in. white fluorescent lamps light open displays and silhouette sign letters.

General Electric

FRANK and justifiable is the pride of Rock Island, Ill., in its newest office building, housing the administrative, sales and service personnel of the Peoples Power Company. Built at a cost of $350,000, it combines simple, smart styling and convenience with the latest in lighting and air conditioning. Except for its rear portion the building is two stories high, has a 120 ft. front and is 150 ft. deep. It is of granite and stone construction and makes generous use of architectural glass blocks.

Outstanding of itself is the building lighting. Every attempt was made to illustrate the various types of lighting available today. Each lighting device serves a definite purpose in the building and its proper practical application in the field of lighting can be demonstrated by its use in this building. General lighting intensities of 45 to 55 ft.-candles are adhered to throughout the building for office and sales floor lighting, 110-120 ft.-candles for displays and 250-300 ft.-candles for show windows.

At present the connected lighting load is 187 kva., representing an average density of 8.5 watts per sq.ft. on sales floor display and office space. This can be increased 50 per cent without affecting lighting fixtures or overloading circuits.

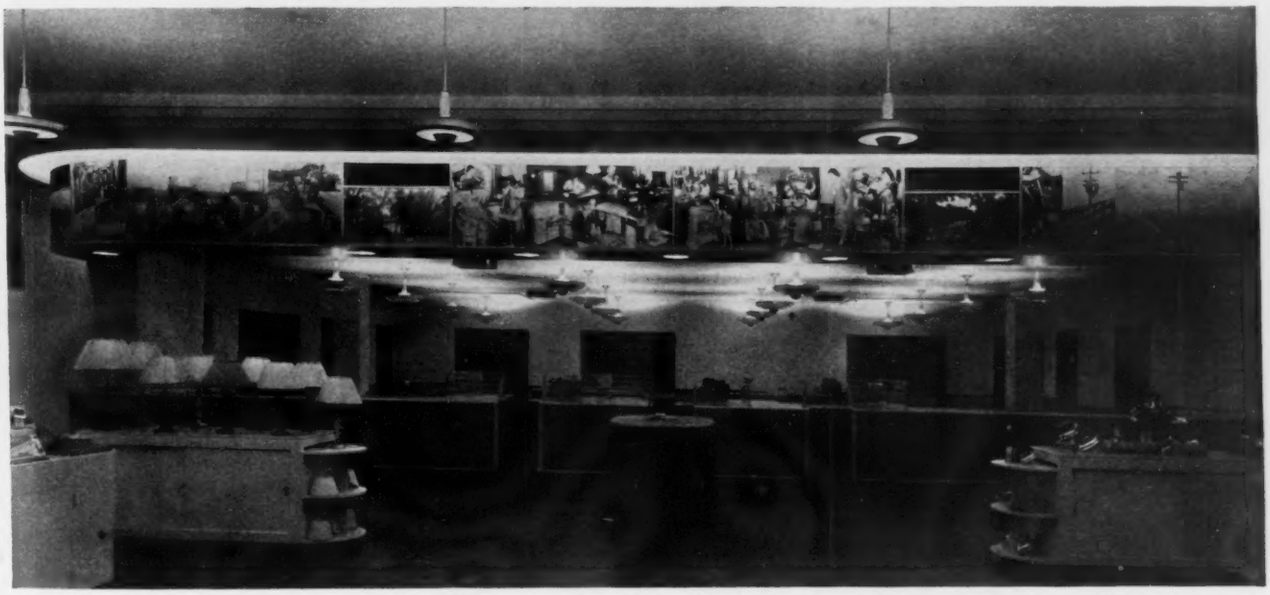
Electric service for lighting is brought into the building from the 4,800-volt primary system and extended to a vault in the basement, where it is stepped down to 115-230 volts by an Inerteen-filled 200-kva. transformer. An Inerteen-filled induction regulator maintains constant lighting voltage regardless of load conditions.

Building architect was Ed Lerch and electrical engineer Fred Campbell, both of United Light & Power Service Company, Davenport, Iowa.

General Electric

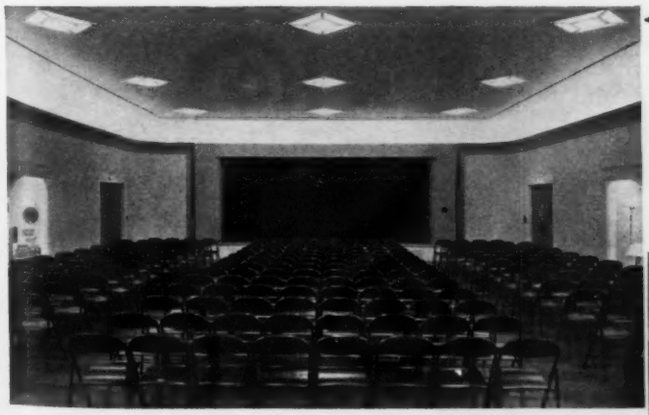
Fluorescent lamp demonstration

For demonstrating effects with both direct fluorescent and direct incandescent light a corner of the salesroom has been equipped with three 5 x 10-ft. panels consisting of 36 24-in. daylight fluorescent lamps, with which are six 300-watt egg crate units flush with the dark blue ceiling.



Cashier's counter

A 65-ft. x 3- ft. photo mural over counter depicts phases of gas-electric service and is cove lighted by 60-watt lamps on 9-in. centers. Seven flush lensed units of 100 watts are over counter, giving 40 ft.-candles. Clerical space behind counter 45 ft. square illuminated at 50 ft.-candles by 750-watt silver bowl indirect fixtures on 10-ft. centers with 10-ft. ceiling. Similar treatment for adjacent bookkeeping and billing rooms.



Lamp salon ⟶

Second floor "store within a store" lamp salon for exhibiting decorative lamps is entirely lighted by lamps on display. A light meter is provided for customer use, its reading being projected on the wall from the false center fixture.

⟵ **Auditorium—Demonstration room**

On the second floor the 40 x 60-ft. auditorium is provided with cove lighting using 42 36-in. and 22 18-in. daylight fluorescent lamps totaling 1,590 watts. They give 6-7 ft.-candles of illumination. In addition, there are twelve flush ceiling units on 12-ft. centers with 300-watt lamps back of a center lens surrounded by eight 10-watt gold Mazda lamps on a separate circuit, back of flash opal glass. These ceiling lights yield 20 ft.-candles. Four small side wall display cases are provided with 280 ft.-candles at the floor line.

More on "Lighting for Revenue"

So much excellent case study material came in for ELECTRICAL WORLD'S *annual editorial feature on lighting, which appeared with the slogan "Lighting for Revenue" July 29 last, that all of it could not be printed in the space allotted. It was difficult to select the articles for feature publication because the average level of quality of all material was so high. Finally, the choices were made principally to exhibit geographical and subject diversity. Realizing that the remaining articles had value equal to those published in the feature presentation,* ELECTRICAL WORLD *now presents another batch in these three pages, holding those that still remain for publication as occasion presents in the regular make-up of following issues of the magazine.*

The Value of Lighting Sales Promotion

By G. B. BARNETT and C. F. WELLS
Manager Lighting Sales Department and Lighting Director, respectively, Empire District Electric Company

Cost per dollar of estimated annual revenue from lighting promotion by the Empire District Electric Company and associated companies operating in and around Joplin, Mo., ranges from 52 to 61 cents. The range of these figures covers all activities of the lighting department, whose work is strictly promotional in nature, in close co-operation with company sales divisions and with dealers who do the actual selling.

Lighting advisers work throughout the territory. They are well trained, having had four weeks of adviser instruction before starting on outside contact work. Women are used in residential work and men on commercial, school and industrial lighting. All have full demonstration equipment. Meetings are held with all dealers. Films and instructional talks are given and co-operative plans are discussed. These meetings are well attended and are very much appreciated by the dealers.

A traveling lighting show, with complete stage settings and attractive lighting displays, well advertised in advance, visits each of our communities in turn. The attendance has been great and returns more than we anticipated. Following the lead of national advertising, we have had a full schedule of newspaper and radio programs. We stimulate dealer interest through personal contact, with newspaper advertising by the utility, calling attention to the merchandise carried by the dealer, and through helping with window displays, cards, new ideas, etc. All advisers offer a shopping service and it is surprising the number of people who use it. Our school lighting programs have caused a rapid advance in this field. We are sure that the results accomplished in school lighting promotional work have given us some of the finest public relations contacts that can be made. As a matter of fact, the value of all lighting promotion, by including this consideration, can be rated much higher than is shown by E.A.R. taken alone.

"Exposition of Light" Inspires Sales

By PAUL T. TYSINGER
Lighting Supervisor Duke Power Company

Possibly one of the most complete exhibits of light sources ever assembled for a traveling show composed the equipment of an "Exposition of Light" used by Duke Power Company in the fall promotional activity of 1938 and from which results continue to come in months later. This impressive educational and scientific exposition afforded thousands of people an opportunity to see the amazing things that can be accomplished with light. A full bus load of equipment, with a portable stage, was required for the lectures and demonstrations, showing the various aspects of light and lighting as practiced in this modern era.

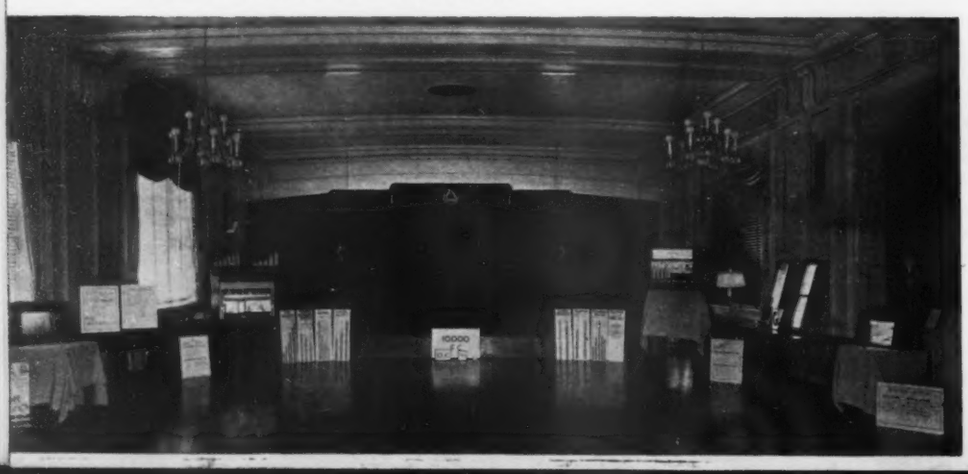
The exposition, originally scheduled to appear in eight principal cities of the Carolinas, has been presented in whole or in part 37 times to more than 22,000 people. The public demand for the show far exceeded all expectations and seven bookings have been made for this fall.

In each of the scheduled towns the exposition remained one full day, giving three shows. The morning session was devoted to salespeople from lamp departments of the furniture and department stores, gift shops and interior decorators. The afternoon session was especially arranged for architects, school officials, teachers and members of parent-teacher associations and women's clubs. The evening program for the public in general was the real spectacle of the exposition, when light was literally on "Dress Parade."

The cost and results of such a large exhibit are often questioned by utility officials when appropriations are requested for educational or promotional purposes. However, the public reaction and the results obtained by virtue of the exposition in our territory cannot be measured in dollars and cents value. We have reports from the field that sales on I.E.S. lamps increased many times following the appearance of the exposition. In one town the Parent-Teacher Association had our lighting engineer make a lighting survey of all city schools. Another city has a program under way to improve the lighting in its schools. A report just received indicates the high school of another city has been rewired and relighted, all because the exposition awakened the officials to inadequate conditions. Almost every week brings additional requests from civic clubs, parent-teacher groups, chapel programs in high schools and colleges, for demonstrations used in the exposition.

In our estimation the exposition gave us the finest type of publicity and certainly won us thousands of new friends, both young and old, who know that "better light means better sight."

Ready for the audience—This complete show, stage and all, is carried in a truck from town to town



Low Cost Revenue From Commercial Lighting

By R. E. HOLDEN
Sales Manager
Cumberland County Power & Light Company

In the first six months of this year the commercial lighting service department of the Cumberland County Power & Light Company, with a total personnel of only two men, added 273 kw. of load with an estimated annual revenue of $16,500 at a cost of 20 cents per dollar. The increase is largely due to added sales of indirect lighting.

The two men work together in a sedan delivery truck in which sample fixtures are carried. Their work is backed up by a substantial volume of direct mail advertising which is sent at intervals throughout the year to various classes of customers, such as industrial plants, stores, gas and oil stations, etc. At the present time the company is also running a series of advertisements on street lighting, jointly sponsored with four other Maine utilities, in the *New England Townsman*, a publication that circulates among municipal officers in cities and towns in the state.

Bank accuracy demands good lighting

In the Crocker First National Bank, San Francisco, 140 luminous bowl indirect fixtures with 300- and 500-watt lamps supply 27 ft.-candles of glare-free illumination. Permanently closed windows, walls and ceiling painted in light ivory and cream tints have 82 per cent reflection factor. A complete rewiring and refixturing job, with air conditioning.

Lighting Has a Boom in San Francisco

By W. P. BEAR
Illuminating Engineer
Pacific Gas & Electric Company

At the end of June, 1939, our commercial and industrial lighting sales were nearly 15 per cent ahead of the same date last year and street and highway lighting sales were nearly 50 per cent ahead. Going as we are now, we should attain a total of $600,000 in new revenue in industrial and commercial lighting and $80,000 in street lighting this year. Right now we are selling against the influence of exposition sales last year.

But that is not the best part of the story. Salesmen are really selling *better lighting*, and they are dong some real *pioneer selling*. Office lighting intensities are going up; 20, 30 and more foot-candles are common, and for difficult seeing tasks 40 and 50 are just ordinary attainments. One lone salesman is pioneering the special and profitable field of inspection lighting in the fruit canning industry. The whole group is tearing in on the schools and a few sales have included as much as six 750-watt totally indirect fixtures per standard classroom. We hope they stay sold on that basis. Sales of lots of 50, 60 and 80 high-wattage lighting fixtures per school job are not uncommon.

A few engineers and the better grade of electrical contractors have gone in for adequate wiring capacities in a big way. We have some jobs where the entire floor spaces in offices are wired for 7.5 to 8 watts per square foot. Low electric rates and good service have helped. We have just made another cut of better than $2,000,000 in our electric schedules, effective July 1 this year. Our job now is to sell the equivalent of the reduction in revenue.

Help to Architects Sells Lighting

By PHILIP PEEPLES
Lighting Sales Engineer
Georgia Power Company, Atlanta

One way that we have been able to help the architect is by actually getting into his drafting room and making electrical layouts on his tracings or by preparing new tracings that are turned over to him to use as his electrical plans. Specifications are made that include not only lighting but other services. This free service is offered only to those architects who customarily do their own electrical work. To the firms that employ the professional engineering services we offer only ideas and suggestions and try to guide the architect's instructions to the engineer.

During the six-month period ended January 1 last one architectural lighting man in the employ of the Georgia Power Company was instrumental in adding 900 kw. in commercial lighting, twenty electric ranges, thirteen water heaters, seven water coolers, eight refrigerators, five dishwashers, four disposal units, five 2-kw. space heaters, one 18-kw. commercial range and one 30-kw. circulating water heater.

In addition to the regular methods of helping the architects we conducted a ten-week lighting school for architects sponsored through the local chapter of A.I.A. A large number of architects and their draftsmen took advantage of the free illumination courses, thereby improving our relations with them.

Good Fellowship Meetings Promote Lighting Interest

By PAUL OTTO
Commercial Supervisor
United Electric Light Company, Springfield, Mass.

We have found that through evening meetings, where a friendly, informal fellowship prevails, we have been able to present to local trade and professional groups different phases in the march of lighting as well as related subjects, such as adequate wiring and code changes.

Our meetings have been held, now, over a period of four years at intervals of about two months during the winter. To these we have invited architects, electrical contractors and electrical engineers, and in the customer groups we have included building managers, factory managers and purchasing agents. Attendance has ranged from 200 to as high as 325 in our auditorium in the Building of Electrical Progress.

In preparing for a typical meeting we circularize the groups to whom the subject of the proposed meeting will be of special interest, issuing a cordial welcome to "bring a guest" and enjoy refreshments (usually coffee and doughnuts) after the meeting. We frequently dress up our circulars with attractive features in photographs, and judging by the responses in the past and the gratifying numbers in attendance we have succeeded to a considerable degree in stimulating interest in improved lighting. We expect to stage a meeting in the fall, where we shall exhibit, as in the past, developments that have recently come to the fore.

Consistent Selling Builds Lighting Load

By CHARLES A. HARRISON
The Toledo Edison Company

The Toledo Edison Company, since 1935, has placed major emphasis upon a broad educational as well as direct sales activity in domestic lighting. The load-building personnel numbered 30 at the initiation of the program in January, 1936, and this was increased steadily until 139 were employed in load building in 1937. The present personnel numbers 129. In January, 1936, only one of the full-time sales personnel of 30 devoted himself to lighting sales and promotion, but in December, 1937, 58 of the sales personnel of 139 devoted their entire time to the promotion of domestic lighting, and during the spring and fall campaigns, totaling about five months, 113 of the sales personnel devoted all or a large part of their time to domestic lighting.

Eleven home-lighting girls were placed in the field in March, 1936, and this number was increased to 28 in July and has remained at that figure. These girls make no direct sales and names of customers for whom they have made lighting surveys are not made available to the direct selling organization. They will assist a customer in making lamp purchases in any store the customer may select and they aid the lamp departments of the stores.

In September, 1936, direct sales activity on portable lamps started with the addition of 22 lighting representatives. During the 30-month period ended December, 1938, the utility sold 13,446 I.E.S. lamps and 14,909 "Pin-It-Up" lamps. During this period 56,710 lighting units were placed in homes on demonstration. All I.E.S. lamps offered for sale were of the best quality

and styling, with a full mark-up on which a dealer could make a profit. No reduced price or bargain lamps were offered for sale.

The 47 domestic territory representatives were directed by means of contests, prizes and special commissions on lamp sales. A well-equipped auditorium was completed in February, 1937, which is available for meetings of women's organizations, with a 20-minute talk on homelighting as a part of each program. The attendance at these meetings for the year 1938 was 14,719.

Talks on lighting were given in the schools and to parent-teacher and club groups, with a total attendance of 33,567 in 1938. Classes were also held for dealer lamp selling groups.

Home lighting advisers made 13,406 surveys, 5,897 call-backs and 3,268 other calls in 1938.

Thus, in a territory of about 100,000 domestic customers, a high percentage of coverage was had.

Checks on minimum bill energy use and average customer data show significant increases in energy use after home-lighting calls. These checks showed an average increase in consumption of 9.9 kw.-hr. per month after the home-lighting survey, which indicates an average annual revenue production of $2,138 per home-lighting adviser.

In 1935 the average domestic use in Toledo was 589 kw.-hr. and in 1938 this increased to 862 kw.-hr., an increase of 273 kw.-hr. for the three-year period. While it is difficult to ascertain directly the effect of the home-lighting activity, checks and estimates indicate that it accounts for about one-third of the average increase in energy use per customer, or about 31 kw.-hr. per customer per year during the past three years.

One Man Can Sell 110 Pin-It-Ups a Day

The "Pin-It-Up" lamp caimpaign conducted by the Lake Superior District Power Company last fall had hardly started when W. J. Hodgkins, president of the company, sent for W. C. (Bill) Lounsbury, Jr., lighting engineer.

"Bill," he said, "those little $1.95 pin-it-up lamps ought to go like hot cakes."

Bill eyed the lamp on the wall. "Yes," he cautiously agreed, "they should."

"A man ought to be able to sell a hundred of them a day," Mr. Hodgkins opined.

Bill sensed trouble, but there wasn't much he could do about it, so he agreed.

"I'll bet you $50 you can't go out and sell 100 of them in a day," said Mr. Hodgkins, watching Bill out of the corner of his eye. As Bill squirmed, he continued: "Or I'll bet you $50 I can do it."

Bill did some rapid mental arithmetic, shuddered, and said: "I'll take that first bet, start at noon today and end at noon tomorrow."

Bill won the bet. He sold the lamps house to house in cold canvass, using a dramatic action selling story and lots of enthusiasm. He sold 40 lamps by 6 p.m., 25 more by 10 p.m. and by 11.45 a.m. he had reported 45 more to total 110. This represented 11 kw. of added connected load, an estimated annual volume of $198.

Window Shopping Weeks Boost Commercial Lighting

By E. N. POPE
Director Sales Promotion and Advertising, Carolina Power & Light Company

In the idea that small-town merchants would react favorably to practical window lighting demonstrations and in order to stage such demonstrations en masse, rather than singly, a plan to promote "Window Shopping Weeks" in the smaller towns served by the Carolina Power & Light Company was evolved.

Eight "Window Shopping Weeks" were conducted in 1938 with more than gratifying results. Member merchants' interest in their trade associations was renewed; merchants themselves proved that interest in buying at home could be created inexpensively, and in every instance additional permanent improvement was made in window lighting, with the more aggressive participants improving their interior lighting as well. The average population approximated 4,000; an average of 47 merchants participated in each town, and an average of 350 watts of additional window lighting was sold to each participating merchant.

The event includes a window decorating contest among the merchants themselves, a 50-word essay contest on "Why is Good Window Lighting an Asset to Our Town" for the public, drawings for prizes in participating merchants' stores and a free dance or other entertainment feature on the final night. Cash prizes are offered in the window dressing and essay contests.

Co-operative newspaper advertisements are suggested and, in every case to date, have been used; window cards to identify participating merchants are distributed without charge, as are the blanks for the essay contest and prize drawings. An entry fee of one dollar is charged each participating merchant to cover the cost of the promotion materials. Newspapers have proved generous with free publicity space prior to and during the activity.

In presenting the plan to the merchants, the company and trade body representatives explain that in order to compete successfully in the window-decorating contest windows should be adequately lighted and lights permitted to remain on between certain hours each evening. To aid the merchant in this direction the company will, without charge or obligation, install any additional equipment deemed necessary to bring his lighting up to standard. At the close of the event this equipment is to be removed unless the merchant wishes to retain it—and most do. The cost of promoting a "Window Shopping Week" in a small community, exclusive of man-power, is negligible and has not in any instance exceeded the amount made available by the entrance fees.

Small Town Technique

By ARTHUR G. SIAS
Manager Municipal Lighting Department, Reading, Mass.

We organize sales campaigns to promote lighting on an average of about three times a year. After having studied the relation of the probable marketing success of some electrical equipment or appliance to season, saturation, and other factors, we notify local distributors and jobbers of our intention to start a selling campaign of a certain commodity at a definite date and through one of them contract for a quantity.

Having completed arrangements as to the product to be sold, we first proceed by building up a mass display of the commodity in our store window, banking lamps, or massing fixtures; in all, making an interesting and striking show of what we have to offer.

Next, for three successive weeks, we insert one quarter page or more advertisements in the local weekly newspaper explaining details and costs simply and briefly. We follow up with a house-to-house solicitation, using three salesmen and covering most of our 6,000 customers, practically all of whom are residents living in a rather compact community. Now for results.

Last winter we followed this procedure closely and sold in two weeks 300 pin-up fixtures, each provided with a 75-watt lamp. We increased our annual income by more than $80. In marketing these, we stressed convenience and low price. For example, in this campaign we sold the pin-up fixtures at $1.19, of which $0.19 represented a first payment and the balance carried over one or two months on the regular light bills.

Before and during "Window Shopping Week"

First, Get the Facts

Too often utility efforts toward improvement of public attitude are based on insufficient or erroneous appraisal — Best way to find out what people think is to ask them questions designed to elicit desired information

GLENN GRISWOLD, *Glenn Griswold Associates, New York*

THE PURSUITS of a vocation and the satisfactions of an avocation have made it necessary for me to observe critically the public relations efforts of the utility companies of this country for more than twenty years. Out of that experience the one impression that comes to mind most often is that the utilities, who by the very nature of their business should be more aware of the public attitude than any other business, frequently know the least about it.

Only familiarity with the process saves one from being appalled by the ambitious commitments which utility companies have made in the name of public relations, apparently without any real effort to obtain the simple and fundamental facts upon which a campaign should have been predicated.

A Healthy Corporate Body

In this respect public relations may be compared to public health. The former is the simple business of making the corporate body healthy and keeping it so. The latter undertakes the same service to human bodies. It never seems to occur to a health authority to suggest that the cure of a human ailment should be undertaken without diagnosis. Yet that is precisely what so many public utility managements undertake when they decide that the health of the corporate body needs correction.

They think they have made a diagnosis, but have they? Ask almost any public utility executive and he will tell you, as several of them have told me recently, that he has the most exact and dependable information in the upper right hand drawer of his desk to show what his customers think of the corporation and what is the attitude of the community toward it. The truth is that for the most part the devil himself couldn't have brewed a more beguiling set of statistics, conclusions and assumptions on which

to predicate a prescription for corporate health than is to be found in the routine reports on public relations experiences that eventually find their way to the desk of the public utility executive.

In the first place, such reports are strained through the self-interest of every individual and every department that had a part in preparing it. In the second place they give misleading and disproportionate weight to recorded complaints and afford little or no evidence of the psychological resistances and resentments that constitute a large part of public attitude, but escape the official attention of service employees.

I was recently asked to analyze the returns from a public relations survey which a power company made among its contact employees. The theory of the management was that the answers, coming from men who knew the public best and presumably were best equipped to measure its emotions, could be used as the basis of a rather ambitious public relations program.

The survey consisted of one simple question, "*What single thing can the company do that will be most helpful in promoting good will on the part of its customers?*" There were 572 replies that were deemed usable. We analyzed and classified these replies in every conceivable way. The one dependable conclusion that stood out above all others was that the study was completely useless as a guide to management. Indeed, such a conclusion might have been reached from the single fact that but four out of the 572 found anything to correct in their own work, in the work of their own department or in the work of their immediate superior. Almost every suggestion was that improvement be made in some other department or that the general policies of the company be so amended that the employee's contact with the public would be pleasanter and easier. These men were not required to sign their names and expose themselves as being responsible for any criticism that might be stated or implied in their answers. They merely indicated their job classifications. Yet they responded to the natural instincts of pride and self-interest that must always color the picture the executive receives of public contacts and customer complaints from service department reports.

Customer Surveys

Furthermore, no analysis of customer complaints is a safe guide to public relations thinking even if the impossible were achieved and the complaint report reflected accurately and exactly the state of mind of every complaining customer and gave his true reaction to the manner in which his complaint was handled. This is true because there is often, if not usually, a vast difference between the attitude of an individual, on the one hand, as the buyer of services and appliances and, on the other hand, as a citizen, as has been revealed by several scientific surveys that have been made in the utility field.

In a recent study intended, in part, to show the relative standing of a power company and a gas company in a medium-sized town 38 per cent of those questioned said that electric rates were too high, while but 30 per cent believed that gas rates were excessive. And yet, when asked whether the city should take over these utilities, 36 per cent said yes as to the gas company, while but 5 per cent wanted the city to operate the electric company. In other words, the gas com-

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Editorials

S. B. WILLIAMS, *Editor*

Commercialism in National Electrical Code Making

HAS commercialism any place in code making? Dr. Lloyd, of the Bureau of Standards and the new president of the International Association of Electrical Inspectors, states that commercial interests should be heard, but should not make the decisions. Furthermore, he says, bargaining and compromise are out of place in code making.

We are inclined to agree with Dr. Lloyd in theory. Certainly a code ought to be made solely in the public interest. Certainly safety should not be compromised by commercialism.

But what is safety? Do the inspectors know? Certainly they see the results of misuse, careless installation, obsolescence, but have they yet ever established a measuring stick for safety?

It has been rather unfortunate that in so many instances where a new development has been offered for code recognition the conflict of commercial interests has created the impression that the approach of the code makers to the problem has been not one of finding out how it might be recognized, but rather why it should not be recognized.

Generally the code makers have listened to both sides and tried to find out where between the two the path of safety lay. Seldom have the code makers had any unbiased facts of their own gathered by an impartial investigator. Until they have these facts, how can they do otherwise than take a middle path?

It has been said, and not without reason, that it is almost as hard for a new development to get code recognition as it is for the camel to go through the eye of the needle. Such a situation is wrong. In the absence of a definite knowledge of what constitutes minimum safety, the principle of code making should be not one of prevention of recognition, but rather one of setting up such safeguards as appear to be reasonably necessary with present knowledge. Experience then will dictate the extent to which these safeguards can be modified from time to time.

We agree it is no reason for code recognition that a new product will decrease the price or provide for more labor or for greater sales. On the other hand, we do believe that those elements are strong reasons why code makers should do everything in their power to find ways and means safely to use the proposed equipment. To that extent certainly commercialization should influence the making of the National Electrical Code.

Electric Versus Gas Range Sales

LAST YEAR for the first time in six years the ratio of electric range sales to gas range sales suffered a reverse. The figures taken from statistics compiled by the American Gas Association show a ratio of fourteen gas to one electric in 1933, improving progressively to 3½ to 1 in 1937, and then 3.7 to 1 in 1938. To have maintained the 1937 ratio would have required the sale of some fifteen thousand more electric ranges.

The gas association has also compiled data on the use of gas in new residences constructed in 1938. In 56,672 new houses, which is approximately one-third of all new houses built in the United States last year, 50,000 or 88 per cent were equipped for gas cooking. If this percentage, which was compiled from figures furnished by local gas companies, holds approximately true for the country as a whole, it is evident that one place where the electric industry must work harder is with the new home. While, of course, gas is still the accepted method of cooking in most cities, and for that reason is more or less automatically installed by the builder, it would seem as though a new house would offer less sales resistance than an old home—less wiring cost, modern appliances. Furthermore, new houses are a fine advertisement for all new and modern equipment.

Steam Generation Secure

RECENT YEARS have seen an intensification of the effort to find ways of using the energy of the sun as it arrives and manifests itself rather than wait for sun-grown vegetation to be converted into coal and oil. Every so often one of these schemes gets publicized and sets the timid jittering for fear steam-generating investment is doomed. The only really successful alternative to fuel power so far is hydro power, but for firm power it is decidedly limited in quantity.

Wind power was tried, in the form of the Madaras rotor, and found wanting from several angles. Ocean

temperature difference was the basis of Claude's experiments off Cuba, abandoned several years ago. Tidal power, exemplified at Passamaquoddy, at first was accorded political support, but now has suffered a check. Thus history eliminates three recent threats to fuel power.

Gas cells, thermocouples and photocells are all in the laboratory stage, if measured in terms of megawatts rather than watts or microwatts; they all have a long way to go for power adaptation. Direct solar energy absorption shows, however, much promise in small scale magnitudes for water heating and, with a flash boiler and storage, may compete with gas and electricity for heating loads. Atom-splitting, according to no less an authority than Dr. Millikan, need not be worried about.

All these schemes look attractive because they offer utilization of free-as-air energy. But most of them appear now to involve almost as much complexity, considerably lower space factor and probably higher cost per kilowatt than a steam-electric plant with all the accessories and auxiliaries that intervene between its coal pile and its buses. Meanwhile the metallurgy of higher pressures and temperatures for steam and the thermodynamics of binary cycles will provide progressive defense for steam plants not only against free energy but against internal combustion engines and external combustion cycles like the promising gas turbine. On the whole, it seems that steam is comfortably secure in dominant position for a long time to come.

Kitten Rescue

ONE of the pesky jobs that have to be performed every now and then is to send out a line truck to rescue a kitten that has climbed a pole and can't get down. It costs money and the linemen feel it's pretty small work. And so it is for them, but have you ever seen a little girl whose kitten was thus saved? Even the huskiest and toughest lineman, who went up the pole cussing, melts when he hands the kitten to the youngster, waiting in ecstasy at the foot of the pole.

H. Armstrong Roberts

This is simply one of the small places where friends are made for the utility. The firemen have passed the buck, but not the utility. Of course the company will get the poor little kitten down, and right away. That's the only way to answer such calls. The kitten has to be taken down anyway, so why not do it cheerfully and promptly?

If it is done in this manner the fault was all with the kitten, but if there is any hesitancy or coldness or delay on the part of the utility, then the shoe is on the other foot—the kitten would not have got in trouble if the pole were not there. Unreasonable thinking on the part of the customer—yes, but a provoked customer can do more harm than a dozen satisfied customers can mend.

Individualism Befogs Network Unit Specifications

SOME PHASES of standardization crystallize into official standards of the industry. Others, like network equipment, are more a matter of standardized patterns and assemblies of component parts. In the network unit field there is hardly any discernible standard arrangement of the elements. Every one seems to find justification for specifying something just enough different from the other fellow to keep the whole art in the field of custom-built production.

Limitations of existing manholes, location of ducts and training of cables undoubtedly warrant some of the departures that thwart almost entirely any production for stocking, except of the basic elements. But it is hard to see why there should be so many little individualities as to amount to a total of some 8,000 possible permutations and combinations in the ultimate.

One wants the filter-press connection here and the oil sampling plug there. The thermometer is wanted in any one of a dozen places (and bosses have to be provided for all likely calls). High-voltage grounding and disconnect switches are wanted 2-position and 3-position and locations vary. Some prefer no interlocks and others duplicate interlocks. Bushings have to roam from top to side to front and the oil gages have to be visible in the local situation. The relative location of primary and secondary switches and the network protector may be left or right or on the sunny side.

As a consequence only an appreciable percentage are uniform enough to approximate an evolving standard pattern. Strange to relate, the individuality in approach seems in some instances to have gone so far as to have dictated the dimensions of the manhole instead of *vice versa*, the prevailing alibi. One hears of instances where vaults could have been much narrower merely by putting the units in tandem arrangement and specifying their assembly accordingly.

There have been more than 13,000 network protector installations in 130 cities in seventeen years. Conceivably the next aggregation of network units can be acquired at less cost if the 8,000 permutations can be reduced to a much more conscionable figure. At least, manufacturers will have to keep on charging for the custom tailoring if that is what the industry prefers.

Fortunately this particular kind of standardization does little to stifle initiative in technological directions, but it can contribute to management's pressing problem of making the capital dollar stretch without jeopardizing quality of service.

War Babies

By CARTER FIELD

This noted journalist gives his personal comments and interpretations on current happenings affecting the electrical industry. His background and his location at Washington make his thoughts informative and interesting even though all may not agree with him

OFFICIALS and business men generally are agreed that if war comes in Europe there will be a tremendous boom in many lines of business, with the electric industry benefiting heavily. It will have to meet very heavy demands for current, and the manufacturing end of the business will have what may easily place it in the first line of war babies.

A glance back at the last war is all that is necessary, especially if the situation is studied with a view to the changed conditions since that time. For example, let us assume a war in which Britain and France are engaged against Germany and Italy over Poland. Other smaller nations may be involved also, and there is a possibility of Russia entering.

Where in the world can South America and other parts of the world not at war buy their electrical equipment, in fact the great bulk of their manufactured goods, except in the United States? In the last great war this demand resulted in a tremendous boom in the United States. This time it should, experts figure, be much greater.

China Keeps Japan Busy

One important reason for this difference is Japan. It will be recalled that Japan had a real boom, in fact the only good times it has had since the early 1900s, as a result. Japan did not take much part in the war. She made a quick, successful campaign, then virtually quit, devoting all her energies to producing goods which could be sold at high prices to the Allies, and to the rest of the world. The fact is, she was the only serious competitor of the U. S. in this world market, though the demand was so great that it was not really competition.

This time Japan will not be so fortunately placed. Either Russia will enter the war or she will not. If Russia enters the war experts believe that Japan will seize that opportunity for conquest of the extreme eastern part of Siberia. If Russia does not enter the war Japan will probably seize the opportunity to complete her expansion, at the cost of Britain and France, further south. Whatever happens, her foray into China is likely to keep her fairly well occupied with military effort, so that she will not be able to turn her attention to manufacturing profits, as she did in the World War.

So that, assuming for the moment that the U. S. does not enter the war, the outlook is that business will boom in the U. S., especially in manufacturing, and that hardly anything conceivable would prevent a demand for all the electric current which can be produced close to manufacturing centers.

Now consider how the operation of neutrality laws would change the situation as compared with the last war. In the first place, it is entirely possible that there will be no change whatever. This writer knows that the British government has been advised that the shrewd thing to do would be not to declare war, no matter how much fighting there may be. This, the Chamberlain government has been told, would put Britain precisely in the position now occupied by Japan, which has been buying armament in this country which under the law she could not if this government recognized that a state of war existed between Japan and China.

It may be said that this course of action would put Washington in a ridiculous position if Roosevelt allowed U. S. manufacturers of "arms, ammunition and the implements of war," to use the language of the law, to continue shipping these to Britain after she was involved in a death struggle with Germany. There is no question about the actual absurdity, but it is not a bit more absurd than the fact that this government has chosen not to recognize a state of war in the Far East.

The plain truth, of course, is that Roosevelt has not recognized a state of war in the Far East because this government is convinced that to declare an embargo would be harmful to China. Hence, admittedly, the course of this government on that situation has not been neutral, but the opposite.

But apply this same disposition to bend the law to suit the desires of the government to the war which may come in Europe. No doubt whatever exists that this government will sympathize with Britain and France against Germany. In fact, "sympathize" is a very mild word indeed to describe what the attitude will be. So if a technicality has been used for more than two years to thwart the plain intent of the law as applied to the Far East, how much greater will be the temptation to use the same technicality for Europe?

And If Not

But there is another angle. Even if Britain should ignore the advice the Chamberlain government has received from Washington and declare war, the situation actually would not be greatly altered. The embargo required by our neutrality law would actually affect very few of the articles Britain has been buying from the U. S., and would wish to continue buying if war came.

Britain has been stepping up her manufacture of "arms, ammunition and implements of war" tremendously. What she will need, if war comes, far more than these are the raw materials, manufactured goods to substitute for the products of those British factories which have been diverted to arms, food, oil, steel, motors, etc. It may be recalled that the only serious fear that Germany might win the last war came when there seemed to be a real possibility that Germany might starve Britain out by her submarine blockade.

There may be tremendous losses this time by German efforts to prevent shipments from reaching Britain and France, but these will only increase the demand for things from the U. S., which is the only question here under consideration.

NEWS OF THE WEEK

Alabama Power to Build New Steam Power Plant

President Martin says $4,000,000 new 40,000-kw. plant is first of three units to be built at Mobile — Plant is part of $16,000,000 program by Commonwealth & Southern

Large-scale refunding and construction operations are soon to be undertaken by the Alabama, Mississippi and Georgia power properties of Commonwealth & Southern Corp., following the sale of the Tennessee electric facilities to TVA and 34 municipalities and cooperatives last week.

Cheered by the possibilities that the present government "appeasement" with the utilities will stick this time and by the passage of the Booth bill by the Alabama Legislature prohibiting the duplication of utility facilities, Commonwealth & Southern is ready to start on an additional $16,000,000 construction program.

Mobile's New Plant

Initial plans call for the building of a $4,000,000 steam-electric generating plant in Mobile by the Alabama Power Co. Thomas W. Martin, president, stated that the new 40,000-kw. plant is the first of three units to be built at Mobile. He said that consumption of coal from the Birmingham fields would amount to 120,000 tons annually. It will be the first new Alabama plant to be constructed since the TVA was organized.

In commenting on the present situation, Mr. Martin said that the "construction of this plant in Mobile is but one step in the large program of construction which we hope to get under way in the near future. It was made possible by action of the Legislature last week in passing the Booth bill and the recent action of Congress in curtailing competitive activities of TVA and unfair loans and grants to municipalities.

"Again business men are expressing renewed faith in individual initiative and that economic freedom so necessary to permit the nation to progress along the lines which in years past have brought it to its position of eminence in world affairs."

The Booth bill passed with but two dissenting votes in the House and two in the Senate. The bill prohibits municipalities from duplicating existing electric facilities without first exhausting every means to effect a purchase.

Procedure Set

Under provisions of this measure, modeled somewhat after Wisconsin and Massachusetts laws, any Alabama municipality now served by a private utility system must first make an offer to purchase the local facilities. If the price offered is not acceptable, the utility may make a counter-proposal. If the deal cannot be successfully negotiated in this way the Alabama Public Service Commission is authorized to set a price. Either party can appeal to the courts through condemnation proceedings from the decision of the commission. The measure was agreed upon by both utility and municipal interests before it passed the Senate, where it originated.

Mr. Martin hailed the passage of the bill as opening the way to stabilizing the power situation in Alabama. He said that it was intended to assure investors and prospective investors that their funds will be safe if invested in Alabama.

"Additional power facilities are necessary to meet rapidly developing demands for power in Alabama," Mr. Martin said. "We are making plans to begin an expansion program which will be financed by private capital and without government subsidy. It should put idle men and idle money back to work."

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TVA and C. & S. Sign New Power Contract

Further co-ordination of private and government electric power facilities was evidenced last week when the Tennessee Valley Authority entered into an agreement with the Commonwealth & Southern Corp. for sale of power to its southeastern subsidiaries.

Power sold by the TVA will average 50,000 kw. at the same regular TVA hydro rate to municipalities and cooperatives. When hydro power is not available the price is based upon the cost of steam generation at steam plants which the TVA acquired from Tennessee Electric Power Co.

The purchase power agreement is to run for 10 years and can be terminated by either party upon eighteen months' notice. Reciprocal emergency standby is also provided in the agreement. It is estimated that the revenues to TVA will exceed $100,000 a month. The purchased power will be taken by C. & S. at existing connections between TVA and member companies of the utility system in South Carolina, Georgia, Alabama and Mississippi.

The power purchase marks the first such transaction between the parties since the Ashwander case rendered a 1934 contract inoperative.

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Opposes Utility Service

Village of Constantine, Mich., has filed suit at Centerville against the Michigan Gas & Electric Co., asking a temporary injunction to prevent the utility from doing business in the community. The village claims the franchise of the power company expired in

DEMONSTRATION—Group of the 250 utility, railroad and industrial representatives and G.E. officials in Schenectady last week during the demonstration and tests of the company's two new oil-less type circuit breakers

1933 and that the company has been doing business illegally since that time. The claim is also made that the company had no authority to use the streets for its poles and electric lines and that the company is doing business only in a limited way, being directly in competition with the village municipal power plant, which was erected about two years ago.

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Raver Named New Head of Bonneville Project

Dr. Paul J. Raver, long connected with the Illinois Commerce Commission and recently named its chairman, this week was appointed as administrator of the Bonneville project. He will assume his duties in Portland, Ore., September 15, relieving acting Administrator Frank A. Banks, who has been serving on a temporary basis since May 4, shortly after the death of J. D. Ross, the first administrator.

Mr. Banks, who was drafted for the Bonneville post while serving as supervising engineer of the Bureau of Reclamation, in charge of the construction of the Grand Coulee Dam, will return to his regular work at Grand Coulee when Dr. Raver takes office.

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Propose Link with TVA Santee-Cooper Project

Preliminary conferences on possibility of a power link between TVA lines and the $40,000,000 PWA-financed Santee-Cooper development in Carolina have been held between the TVA and South Carolina officials.

Robert M. Cooper, general manager of the Santee-Cooper project, said that such a tie-up would be beneficial to both projects. Indications are that nothing definite can take place until J. A. Krug, TVA chief power engineer, returns from his vacation September 1.

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TVA Customers Buy Electric Appliances

Domestic consumers of TVA power purchased about $3,687,000 worth of residential electrical appliances during the twelve months ended June 30, according to reports to TVA by about 500 private appliance dealers. The total was more than double the $1,612,000 total sold during the preceding year.

Average sales per customer amounted to approximately $52.50 during the period, compared with $54 in the preceding year. The figures are based on the weighted average of customers connected each month. The number of residential customers, exclusive of government reservations, has increased from 35,800 at the end of 1938 fiscal year to 106,300 on June 30, 1939, not including customers of the system purchased by Memphis.

Sales included 8,680 refrigerators, 4,288 electric ranges, 1,447 water heaters, 629 electric water systems, 4,949 washing machines and 47,725 of all other types of appliances.

In Knoxville, where the private system was purchased on September 2, 1938, and operated under TVA rates, appliance dealers reported sales of $1,454,000 of appliances.

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Plan $60,000 Project

Announcement has been made that work is to commence in the near future on a new dam and power house for the Gananoque (Ontario) Electric Light Co. It will cost approximately $60,000.

New Circuit Breakers Demonstrated by G. E.

Indicative of the active interest of utility, industrial and railroad electrical engineers in ways to eliminate oil from electrical equipment was the attendance of 245 of these men at the demonstration of General Electric's two new oil-less circuit breakers at Schenectady.

Two breakers, an air-blast unit and a magnetic blow-out type called "Magne-blast," were subjected to test of opening and of closing-opening on short circuits up to about 150 per cent of their ratings without evidencing any distress and without showing any damage beyond slight contact burning, which was to be expected.

The air-blast breaker demonstrated was rated at 15,000 volts, 500,000 kva. interrupting capacity. It handled 80,000 amp. of peak inrush current at 14,500 volts and interrupted 730,000 kva. after six cycles in the final closing-opening test. Duration of the arc was one-half cycle.

Rated at 5,000 volts, 100,000 kva., the "Magne-blast" breaker interrupted 140,000 kva. in an opening test. Seven operations were made with each of the two breakers, which were then disassembled for examination by the visiting engineers.

D. C. Prince, engineer of the G. E. switchgear division, stated that the breakers are ready to go into service. He said that the air-blast breaker will be made available in ratings up to 3,500,000 kva. interrupting capacity at 287,000 volts. Both the air-blast and the "Magne-blast" breaker have been designed to permit standard arrangement of buses, current transformers, mechanical interlocks and associated devices, Mr. Prince stated. Each breaker is assembled and shipped as a single unit.

Seattle Utility Takes Lead in Electric Rate Slash

Caught off guard, city cuts under new schedule, but company meets competition — President McLaughlin says he is "getting kick out of it" — Duplicate systems seen costly

A tug of war in the reduction of electric rates in Seattle by the city and the Puget Sound Power & Light Co. recently presented an unusual situation as first the company cut its rates, then the city slashed slightly under, and the company meeting the city's new schedule.

With the customers getting the benefits of the merry-go-round, thought was given by the city and the utility as to what the future holds, as far as rates are concerned, in an area served by duplicate systems.

Duplication Costly

It was pointed out that it is superficial reasoning to assume that the continued existence of two separate systems insures the consumers the lowest possible prices. Tacoma, with a single system, has long enjoyed domestic rates lower than those in Seattle, it was declared. The late J. D. Ross and Superintendent E. R. Hoffman stated in City Light's annual reports that the city could save $3,000,000 annually by eliminating the duplicate system.

Following conferences with the Department of Public Service, Puget Sound Power & Light recently announced that rate reductions resulting in a saving of $700,000 a year would be made effective September 1.

The move caught the city off guard and immediately Superintendent Hoffman announced that he would file a new schedule to meet the competition. It was a case where the utility took the initiative and the city followed in lowering rates, rather than the city, with its municipal operations, setting the pace.

$210,000 Rate Cut

When the City Council approved City Light's new rates, to save its customers $210,000 a year, it was found that they were slightly under the utility's schedule. No time was lost by President Frank McLaughlin of Puget Sound in dropping his rates further to meet the city's cut under his first schedule.

First, Puget Sound set a schedule for residential customers of 4½ cents a kilowatt-hour for the first 40 kw.-hr., instead of 5 cents, and the second block of 100 kw.-hr. at 2½ cents instead of 3 cents per kilowatt-hour. The additional blocks remained unchanged, the second 100 at 2 cents per kilowatt-hour, with the minimum of 1 cent for all over 240 kw.-hr.

The city countered with a schedule of a cut from 5 cents to 4½ cents a kilowatt-hour for the first 40 kw.-hr. and from 2 cents for the next 200 kw.-hr. to 2 cents for the next 180 kw.-hr., and ¾ cent for each kilowatt-hour thereafter.

Mr. McLaughlin immediately announced that he would meet the city's cut. Commenting, he said:

"I'm getting a big kick out of it. Perhaps we should make the second block 179 instead of 180. I'm glad to have it recognized that while saving our customers dollars we have also watched out for their pennies. Of course we'll meet it and the Washington Department of Public Service so approves."

See Better Business

Both systems indicated that the new promotional rates would act as a stimulant to induce more customers to have an all-electric home and make it possible for the average home owner to have electric cooking, refrigeration and water heating.

Some of the advocates of public utility districts in the state saw in the rate cuts by the utility a move to stop the spread of the public ownership movement. Others saw the rates as low as could be offered in the sale of power from the government dams. It was pointed out that any action taken by various public utility districts to condemn piecemeal the private company holdings in their localities affect the Seattle situation. It was advocated that joint action in any acquisition plan is infinitely preferable to piecemeal purchase or condemnation.

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Housing Board Will Take Utility Power

Authorization for the Carolina Power & Light Co. to sell power to the Raleigh Housing Authority at a rate described by Utilities Commissioner Stanley Winborne as "some lower than the commercial rate" has been announced recently by Commissioner Winborne.

The contract is the first of its nature in the state, Mr. Winborne said, and explained that the lower rate was possible because the Housing Authority guaranteed to pay the bill and that the power would be delivered to the authority at one point, and not through a meter to each apartment in the developments planned by the authority. The order also sets out that the Housing

REBUILDS DAM—When rebuilding operations are completed, this dam on the Shetucket River at Occum hydro-electric plant of Norwich, Conn., municipal lighting department will restore 1,000 kva. to the system production facilities. The dam was put out of service by the flood last fall

Authority is a non-profit corporation devoted to the public use.

The rate is as follows: $2 for the first 150 kw. or less of demand; $1.30 for each kilowatt of demand; $1.20 per kilowatt-hour for first 100 kw.-hr. per kilowatt of demand and 0.85 cent per kilowatt-hour for all additional kilowatt-hours.

The Housing Authority plans to spend approximately $2,000,000 for two developments to house more than 200 families each.

•

Board Issues New Rate Regulations

Louisiana Public Service Commission has directed the Gulf States Utilities Co., Lake Charles, effective with all billings subsequent to August 1, to publish and file a schedule of rates, rules and regulations applicable to that class of service rendered by it within the state of Louisiana designated as general commercial service, as follows:

This rate is applicable under the regular terms and conditions of the company to the total lighting and power service of any commercial customer if taken through a single meter or metering equipment in accordance with the company's rules and regulations and if the power factor of the total load is 0.85 or higher during all months of the year.

Rates for this service shall be for the first 200 kw.-hr. 5.5 cents per kilowatt-hour, next 200 kw.-hr. 5 cents per kilowatt-hour, next 1,100 kw.-hr. 4 cents per kilowatt-hour and all additional 2.5 cents per kilowatt-hour.

Electric service furnished under this rate shall not be used by the customer as an auxiliary or supplemental service to engines or other prime movers, or to any other source of power. Customers shall not resell any energy purchased under this rate.

•

Duke Power Wins Decision in Dispute With Co-op

Dismissing a protest of the new Laurens Electric Co-operative, Inc., the South Carolina Public Service Commission has granted the Duke Power Co. a certificate of public convenience and necessity to erect and operate a 6-mile rural line in the Trinity Ridge community of Laurens County.

Duke Power had filed an application with the commission for a certificate authorizing it to build this line. In the meantime the Laurens co-operative had been organized and it filed a protest, indicating that it would like to build a line in that section. A long hearing on the matter was held before the commission.

Hold First Meeting on Adequate Wiring

Western regional conference in San Francisco sees way to spread plan

That adequate wiring promotion is ready to roll on with the same momentum as the successful industry campaigns on refrigeration, Better Light-Better Sight and the modern electric kitchen was the consensus of participants in the Western regional adequate wiring promotion conference held in San Francisco last week. First of a series sponsored by the National Adequate Wiring Bureau, the conference drew an attendance of 110 representatives of all industry branches from eight Western states and Canada.

Especially valuable was the interchange of field experience in wiring promotion, which included everything from complete application of the national AWB certification program in southern California and Red Seal plan in other sections to isolated promotions by individual contractors.

Factual testimony cleared all doubt as to the ability of the industry to sell adequate wiring co-operatively and successfully to new residences. Disagreement arose over selling adequacy in rewiring old occupancies, although several speakers admitted that the new materials and techniques of the code changes proposed by E.E.I. would assist in opening this market.

Sees Sales Problem

Chairman Ralph Wiley, chief of San Francisco's department of electricity, declared that "selling adequacy involves convincing the consumer of the necessity for sufficient outlets and copper capacity to permit any desired use of lighting or appliances with assurance of convenience, safety and proper voltage." The problem, he declared, was a sales one, which should be stripped of technicalities and dressed with all of the customer appeal and glamor which the industry was capable of producing.

Discussions brought forth a suggestion that electrical contractors form a syndicate to install rewiring on a mass production basis, using specialized techniques and man-power. Utility co-operation would be solicited in selling. Provision would be made to reduce inspection costs through posting a bond. "Package" methods would be employed where possible.

Several inspectors present at the meeting indicated that their group was sympathetic with any program that would promote adequacy in old occupancies because it would eliminate much hazardous and unsafe "lamp cord" wiring.

It was brought out during discussions that because the contractor is too busy making a haphazard and relatively inadequate living, stimulus and leadership should come from other branches of the industry, and particularly the utilities. It was stated that creation of customer dissatisfaction with existing wiring is the key to solving the rewiring problem.

Resolutions Passed

Before adjournment the conference passed three resolutions. The first requested NEMA to consider placing a replica of a duplex outlet in the package with every small appliance sold, the replica to explain something about adequate wiring and to suggest that the customer secure information from a contractor or the utility. Another indorsed the code adoption of thin-wall insulation and proposal to permit new space factors in conduit as an aid to rewiring. A third proposed the appointment of national industry committees to (1) define specifically adequacy as applied to wiring and (2) to study the desirability of changing the code table on the carrying capacities of wires.

•

Tennessee Utility Head Gets Farewell Gift

Employees of Tennessee Electric Power Co. presented to President Jo C. Guild, Jr., a "farewell gift," a leather-bound book with autographs of the 2,791 employees.

Fourteen Chattanooga firms and individuals, including Mayor E. D. Bass and Judge Will Cummings, who described themselves as "friends of Tennessee Electric Power Co.," which was purchased on August 15 by the TVA and municipalities, took a full-page advertisement in a Chattanooga newspaper to express their thanks to TEPCO officials and employees.

"Thank you, Wendell L. Willkie (president Commonwealth & Southern Corp.) and hundreds of TEPCO employees for your very important chapter in the development of Chattanooga and the Tennessee Valley," the advertisement read.

"The pioneering spirit exemplified by the founders of your company and continued by you has resulted in the building of one of the most efficient utilities in the country—one that has enabled Chattanooga to enjoy uninterrupted service and low rates.

"The taxes you paid into state, county and municipalities in this area have consistently helped support such governmental activities as schools, water, fire and other services."

Code Changes Under Fire by Electrical Inspectors

Proposals by E.E.I. fare well at first regional convention in San Francisco — Indorsement given to some changes, while others meet strong opposition — Facts and experience should set standard

Proposed changes in the National Electrical Code, as made by the Edison Electric Institute, fared rather well at the first of the regional inspector conventions, the joint convention of the Northwestern and Southwestern sections, International Association of Electrical Inspectors, meeting in San Francisco last week.

Thinner insulations received indorsement, the article committee's recommendations on space factor of conduit fill (not what E.E.I. asked, though) were indorsed, bare neutral was turned down and the CNX cable provisions of the Article 300 committee were indorsed.

Three Main Addresses

Not without opposition, however, were these indorsements voted. The ground for the controversy was laid in the three addresses which the crowded program of the convention permitted, those of Dr. Morton G. Lloyd, E. A. Brand and A. R. Small.

Dr. Lloyd, National Bureau of Standards, Washington, D. C., as president of I.A.E.I., declared that code making should be based on known facts and experience. "One should not compromise with safety; therefore commercial considerations must take secondary place and not interfere with setting standards of reasonable safety. Bargaining and compromise are out of place in code making. Commercial interests should be heard, but should not make the decisions."

Of thinner insulation and conduit occupancy he had little to say. But of bare neutral he said: "A bare conductor inside a run of conduit is entirely superfluous and a waste of both copper and space. As I see it, the question resolves itself into one of whether the conduit system itself should be used as a return conductor, and the subject should be discussed upon this basis and not upon the basis of installing bare copper inside of metal conduit."

Explains E.E.I. Proposals

The Electrical Development League entertained the convention as its guests and presented E. A. Brand, Buffalo, Niagara & Eastern Power Corp. and chairman of E.E.I.'s wiring committee, who discussed the E.E.I. reasoning of its proposals for changes in the code. He reiterated the E.E.I. published declaration of purpose and assured the industry gathering that E.E.I. felt these changes safe.

Mr. Brand made quite a point when he referred to the progress in other industries so obvious to those who visit the world fairs. He said that old buildings are dated by inadequate wiring. Two main purposes moved the E.E.I. to these proposals, he said: (1) Increase wiring adequacy in new residences, (2) do something about the 95 per cent of commercial and industrial buildings that are not keeping pace electrically with the times.

A. R. Small, president of Underwriters Laboratories, Inc., and chairman of the electrical committee of N.F.P.A., said that the National Electrical Code is not to build business for central stations, or contractors, or to make work for electricians. Its purpose was not that of providing for any worthy objective unless it was that of safeguarding persons or property against hazards. He suggested that there was a responsibility to go ahead with research and new ideas and developments.

•

Wyman Station Adding Third Generating Unit

Contracts have been placed by the Central Maine Power Co., Augusta, for a third generating unit for the Wyman hydro-electric station on the Kennebec River at Bingham, to round out the design of the plant and enable water to be used with maximum efficiency at this site and in connection with the rebuilt development of the company near by at Solon. The new machine is to be a General Electric generator rated at 26,667 kva., direct-driven by an Allis-Chalmers vertical waterwheel of 34,000 hp.

Three Westinghouse 8,889-kva., oil-insulated, forced-cooling transformers, rated at 13.8 kv. primary and 66.4 kv. (115 kv. Y) secondary, have also been purchased for use with the new unit.

•

Manufacturers to Make Units Designed by REA

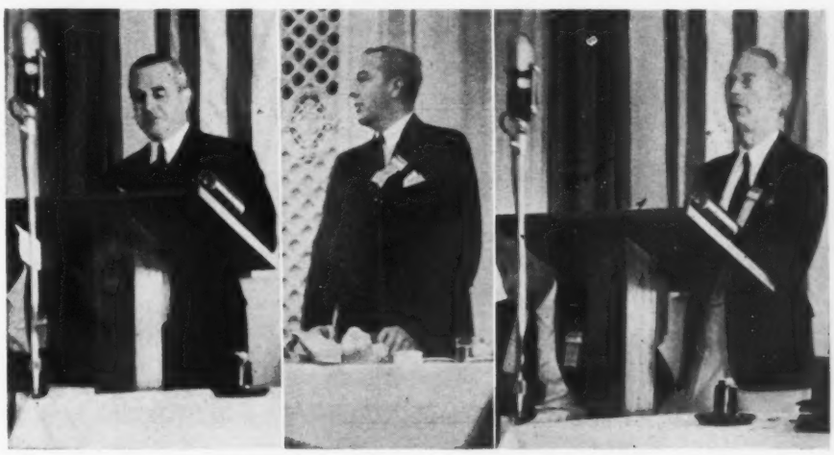
Electrical equipment manufacturers are going into production on an REA-designed transformer-circuit-breaker-lightning-gap-cable assembly that can be sold to co-operatives or private utilities for $35 to $45. With a capacity of only 600 kva., the unit is intended for temporary introductory connection of farmers to existing power lines at a special minimum rate of a dollar a month. Economies in the design include use of a bakelite transformer case, a magnetic-type circuit breaker and a new combination and ground costing only 3 cents a foot.

It is intended to try these units out in tenant-farmer and share cropper districts in Mississippi, Louisiana and Texas before offering them in other parts of the country.

•

Primary Load Increases

Hydro-Electric Power Commission of Ontario reports primary load for all systems in July at 1,365,878 hp., compared with 1,248,549 hp. last year, an increase of 9.4 per cent.



INSPECTORS' CONVENTION—James B. Black, president of Pacific Gas & Electric (left), welcomed delegates to the I.A.E.I. convention in San Francisco last week. E. A. Brand, Niagara Hudson Power (center), presented the E.E.I. proposals; and Dr. Morton G. Lloyd, Bureau of Standards, president of the I.A.E.I.

Rural Sales Meeting to Be Held by E.E.I.

The Edison Electric Institute will conduct its first National Rural Sales Conference on September 21-22, to be held in the hayloft of the Electrified Farm at the New York World's Fair.

The conference, built around the theme of "Helping the Farmer Profit from the Use of Electricity," has been arranged under the auspices of the institute's general sales committee, H. E. Dexter, chairman.

Rural representatives from utility companies in all sections of the country are expected to attend the meeting, which will devote its attention to the farmer's use of electricity to increase his profit from his farming operations. The first day's program will be devoted to formal presentations by authoritative speakers on rural sales development. The second day will be devoted to round-table discussions for the exchange of experiences and comment on pertinent subjects, led by men who are actually on the rural sales firing line.

•

Group Changes Name

Upon the recommendation of the sections committee of the American Institute of Electrical Engineers, the board of directors has authorized a change of name of the Baltimore section to the Maryland section. No change in section territory is involved.

•

Meter Conference Called

Announcement has been made that a joint meeting of the meter and service committee of the Edison Electric Institute and the committee on metering and service methods of the Association of Edison Illuminating Companies will be held September 20-22 at the Leland Hotel, Springfield, Ill. On Wednesday, September 20, an inspection of the plant of the Sangamo Electric Co. will be made. The following day the meter committees will meet and on September 22 a joint meeting will be held with meter manufacturers.

•

Explain Adequate Wiring in Baltimore Schools

Approximately 20,000 school children have received a dramatic exposition of the advantages of adequate wiring in the home through the adequate wiring cabinet designed by the Consolidated Gas, Electric Light & Power Co. of Baltimore, which has been on display in the junior and senior high schools in that city. The exhibit visited fifteen schools and remained from two to four days in each. In some of the schools it was part of the school exhibit open to the public.

•

Pacific Coast Meetings

Launching its program for 1939–40, Pacific Coast Electrical Association has scheduled division conclaves in northern and southern California. These will be held at Long Beach, Civic Auditorium, October 12–13; San Francisco, Fairmont Hotel, October 19–20.

MEETINGS

Pennsylvania Electric Association—Annual convention, Bedford Springs, Pa., September 6-8. A. B. Millar, managing director, Telegraph Building, Harrisburg, Pa.

Rocky Mountain Electrical League—Annual convention, Estes Park, Colo., September 7-9. George E. Lewis, manager, Gas and Electric Bldg., Denver, Colo.

Electrochemical Society—Fall convention, Hotel Commodore, New York, N. Y., September 11-13. Dr. Colin G. Fink, secretary, Columbia University, New York, N. Y.

International Association of Electrical Inspectors—Western section, Hamilton, Ont., September 11-15; southern section, Asheville, N. C., September 18-22.

Wisconsin Utilities Association—Annual convention accounting section, Plankinton Hotel, Milwaukee, Wis., September 21-22; electric section, commercial and technical divisions, November 6-7, Schroeder Hotel, Milwaukee. A. F. Herwig, executive secretary, Room 502, Brumder Bldg., 135 West Wells St., Milwaukee, Wis.

National Industrial Advertising Association—National conference, Hotel New Yorker, New York, N. Y., September 20-22. William H. Easton, chairman, publicity committee, 420 Lexington Av., New York, N. Y.

Edison Electric Institute—Rural Sales conference, Electrified Farm, World's Fair, September 21-22; prime movers committee, Institute headquarters, 420 Lexington Av., New York, October 2-3; electrical equipment committee, New Ocean House, Swampscott, Mass., October 9-10; transmission and distribution committee, New Ocean House, Swampscott, October 10-11.

Association of Iron and Steel Engineers—Annual convention and exposition, William Penn Hotel, Pittsburgh, Pa., September 26-29. Brent Wiley, managing director, Empire Bldg., Pittsburgh, Pa.

American Institute of Electrical Engineers—Great Lakes district, Minneapolis, Minn., September 27-29; Middle Eastern district, Scranton, Pa., October 11-13. H. H. Henline, national secretary, 33 West 39th St., New York, N. Y.

Indiana Electric Association—Annual convention, French Lick, Ind., September 28-30. Tom C. Polk, secretary, 607 Traction Terminal Bldg., Indianapolis, Ind.

International Municipal Signal Association—Annual meeting, Providence-Biltmore Hotel, Providence, R. I., October 9-12. Irvin Schulsinger, secretary, 7 East 42 St., New York, N. Y.

National Electrical Contractors Association—Annual meeting, Bellevue-Stratford Hotel, Philadelphia, Pa., October 9-12. L. W. Davis, general manager, 420 Lexington Av., New York, N. Y.

National Electrical Wholesalers Association—Semi-annual convention, Hotel Gibson, Cincinnati, Ohio, October 16-20. E. Donald Tolles, managing director, 165 Broadway, New York, N. Y.

National Safety Congress and Exposition—Atlantic City, N. J., October 16-20.

Empire State Gas & Electric Association—Annual convention, Westchester Country Club, Westchester, N. Y., October 19-20. George H. Smith, secretary, Grand Central Terminal, New York, N. Y.

National Electrical Manufacturers Association—Annual meeting, Palmer House, Chicago, Ill., October 23-27. W. J. Donald, managing director, 155 East 44th St., New York, N. Y.

Iron and Steel Men Plan Annual Meeting

More than 5,000 steel mill engineers and operating executives will convene in Pittsburgh, Pa., September 26–29, when the Association of Iron and Steel Engineers will hold its 35th annual convention and iron and steel exposition at the William Penn Hotel. A comprehensive technical program embracing virtually every field of steel mill engineering has been arranged. There will be twenty-five papers presented by leading authorities on steel plant practice.

The Iron and Steel Exposition, one of the outstanding features of this convention, will be housed under the same roof as the technical sessions. More than a hundred steel mill equipment manufacturers have planned to exhibit their latest designs. During their stay in Pittsburgh the members and guests of the association will visit the new Irvin Works and the Edgar Thomson Works of the Carnegie-Illinois Steel Corp.

•

Insulation Group to Meet

The Conference on Electrical Insulation, sponsored by the division of engineering and industrial research of the National Research Council, will hold its next annual meeting early in November at Cambridge, Mass., Chairman J. B. Whitehead has announced. The exact dates will be announced later.

•

Desvernine to Speak

Raoul Desvernine, president of Crucible Steel Co., will be the main speaker at the A.I.E.E. Middle Eastern district meeting to be held at Scranton, Pa., October 12, at the Hotel Casey. George M. Keenan, manager of industrial and commercial sales of Pennsylvania Power & Light Co., Allentown, is arranging the program.

•

Promotes Stokers

The Electrical League of Cleveland is promoting automatic stokers through the distribution of a booklet telling the advantages in meeting heating problems.

•

City to Spend $18,000

City of Portland, Ind., will purchase an acre of ground north of the municipal light and power plant for an $18,000 improvement. Authority was granted at the recent meeting of City Council.

Output Rises to Set All-Time High

Marking an all-time high as well as a new summer peak for 1939, production of electricity for the week ended August 19 was 2,367,646,000 kw.-hr., according to the Edison Electric Institute. The previous record was 2,362,-947,000 kw.-hr., output for the week ended December 24, 1938.

Output for the week of August 19 was 10.7% greater than for the corresponding week of last year—a wider margin than in the two previous weeks—and about 2.8 per cent above that for the corresponding week of 1937. The gain over the preceding week was seasonal, but the margin, 1.5 per cent, approximately, was greater than in earlier years, comparing with 0.23 per cent in 1938 and with 0.15 per cent for two years ago.

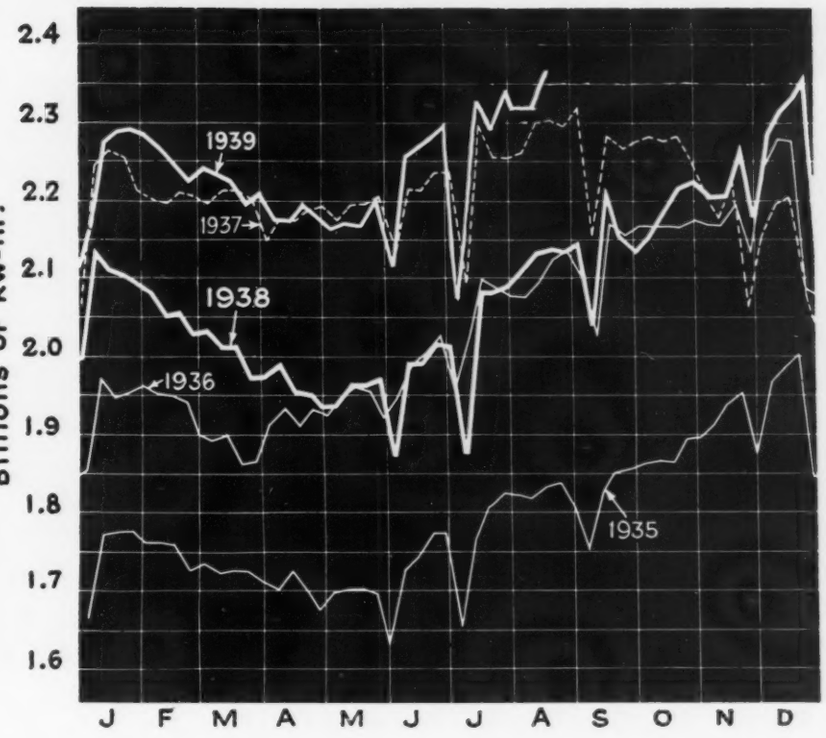
Another encouraging feature of the record is that if the output curve follows the trend of earlier years, an even higher summer peak is in prospect. And if the present trend continues, a still greater winter peak may be realized.

Weekly Output, Millions Kw.-Hr.

1939		1938		1937	
Aug. 19	2,368	Aug. 20	2,139	Aug. 21	2,304
Aug. 12	2,333	Aug. 13	2,134	Aug. 14	2,301
Aug. 5	2,325	Aug. 6	2,116	Aug. 7	2,262
July 29	2,342	July 30	2,094	July 31	2,256
July 22	2,295	July 23	2,085	July 24	2,259
July 15	2,324	July 16	2,084	July 17	2,298

Per Cent Change from Previous Year

	Week Ending Aug. 19	Aug. 12	Aug. 5
New England	+11.6	+12.7	+14.1
Middle Atlantic	+12.4	+10.0	+ 8.7
Central Industrial	+12.9	+11.1	+12.1
West Central	+ 3.6	+ 1.4	+ 2.8
Southern States	+ 7.1	+ 6.8	+ 8.5
Rocky Mountain	+16.2	+12.8	+ 9.8
Pacific	+10.0	+ 8.3	+ 7.3
United States	+10.7	+ 9.4	+ 9.9



British Plant to Spend $4,460,000 on Extensions

Manchester (England) City Council has approved the expenditure of £892,-000 ($4,460,000) on the extension of its Stuart Street power station. The new plant is to include two 30,000-kw. turbo-alternators each with a 750-kw. house service generator and condensing plant; four boilers of 130,000 lb. per hour evaporation, two boilers to be converted from 200 lb. to 375 lb. per sq.in. steam pressure, and extensions of coal-conveying and ash-removal plant.

Three new 40,000-kva. transformers are to be installed, together with four 6,600-volt, 750,000-kva. rupturing-capacity switch units, five 33,000-volt, 750,000-kva. switch units and eleven 6,600-volt, 500,000-kva. feeder units and automatic voltage regulating equipment.

•

Power Sales Rise 10%

Union Electric Co. of Missouri sold 10.83 per cent more power in July to large consumers than in the same month last year and 2.49 per cent more than in June. Power sales in June were up 18.01 per cent over the same month of 1938 and May sales showed a gain of 14.99 per cent compared to last year. Power sales in July amounted to 28,788,358 kw.-hr., against 25,974,-963 kw.-hr. in the same month last year.

•

Diversion Case Deferred

The diversion hearing of the Niagara Falls Power Co. before the Federal Power Commission will move into its final phases before Chief Examiner Frank A. Hampton on August 29. Extension of the court recess was made on August 11, granting a two weeks' delay at the request of company counsel.

•

British Output Advances

Returns made to the British Electricity Commission show that 1,918,000,-000 units of electricity were generated by authorized undertakings during July, as compared with the revised figure of 1,656,000,000 units for the corresponding month of 1938, an increase of 15.8 per cent. During the first seven months of the year the total amount of electricity generated by authorized undertakings was 15,488,000,000 units, compared with the revised figure of 13,609,-000,000 units for the corresponding period of 1938, an increase of 13.8 per cent.

•

July Energy Sales Rise

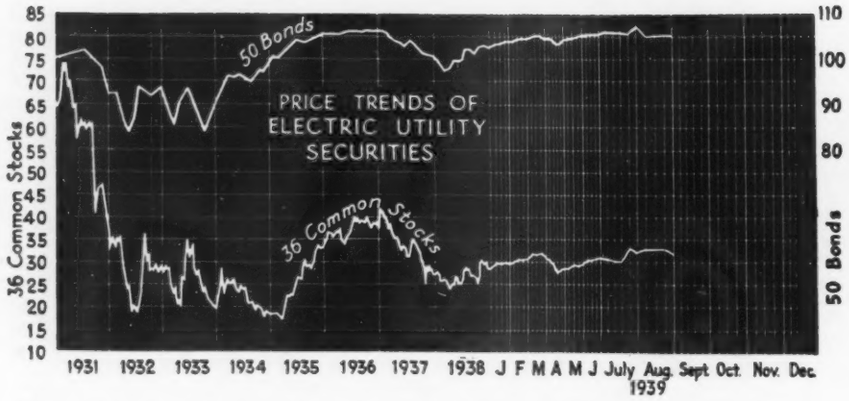
Total sales of energy to ultimate consumers by eleven large electric utilities amounted to 578,894,172 kw.-hr. in July, 1939, as compared with 521,889,507 kw.-hr. for the same month last year. This is a 10.9 per cent increase in sales. This is the second month since August, 1937, that every one of the eleven companies reported percentage increases in their total sales to ultimate consumers over the corresponding month of the previous year.

•

Holders Approve Merger

Merging of East Newark Gas Light Co. and the Ridgewood Gas Co. into Public Service Electric & Gas Co. was approved recently at meetings of stockholders of the three companies. This step practically completes a program that has been in progress for some time of simplifying the corporate structure of Public Service Electric & Gas Co. by eliminating, through merger or otherwise, its underlying subsidiaries.

Electric Utility Stocks Slump in Week


50 Bonds
PRICE TRENDS OF ELECTRIC UTILITY SECURITIES
36 Common Stocks
36 Common Stocks
50 Bonds
1931 1932 1933 1934 1935 1936 1937 1938 J F M A M J July Aug. Sept Oct. Nov. Dec. 1939

Electric utility stocks dropped in the week, following a series of weekly increases that began with the week of July 8. "Electrical World" index of common stocks was off 1.4 points to 31.8; year ago, 27.1. The dip in the bond index was 0.3 point to 105.6

Preferred Dividends Voted on Arrears

At a special meeting of the directors of the Wisconsin Public Service Corp. in Milwaukee the regular quarterly dividends of $1.75 a share on the 7 per cent preferred, $1.62½ a share on the 6½ per cent preferred and $1.50 a share on the 6 per cent preferred stocks were declared, payable on September 20 to holders of record of August 31. In addition a payment of one-third of the delinquent preferred-stock dividends was authorized and will be made on September 30 to holders of record of August 31.

Wisconsin Power & Light Co. restored full preferred rates when it declared quarterly dividends of $1.50 on the 6 per cent cumulative preferred and $1.75 on the 7 per cent cumulative preferred, both payable September 15, of record August 31. Since March 15, 1937, the company has been paying preferred dividends quarterly on both issues at three-fourths of the full rate.

Directors of the Central Maine Power Co. have declared dividends of $1.50 on the 6 per cent preferred, $1.50 on the $6 preferred and $1.75 on the 7 per cent preferred stock. Dividends on all of these issues are in arrears.

•

Utilities Register Issues with SEC

Public Service Co. of Indiana has filed an application with the SEC under the Holding Company Act for exemption from the requirement of filing a declaration in connection with its proposed sale of $38,000,000 first A 3¾s of 1969 and $10,000,000 serial debentures of 1940–49. The Indiana Public Service Commission has authorized the issues.

Marion-Reserve Power Co. has filed a registration statement covering an issue of $7,750,000 first mortgage bonds due September 1, 1959. The company also plans to issue $1,250,000 of 2⅞ per cent promissory notes.

Central Ohio Light & Power Co., a subsidiary of Crescent Public Service Co., was granted exemption by the SEC from provisions of Section 6 (B) of the public utility holding company act of 1935 in regard to the issue and sale of its first mortgage 4 per cent bonds, series C, due August 1, 1964, in the principal amount of $4,100,000, its 3½ per cent serial notes, due August 1, 1940, to August 1, 1944, in the principal amount of $500,000 and 2,200 shares of its $6 preferred shares (cumulative), no par value.

SEC has approved an application of Leonard S. Florsheim, trustee Inland Power & Light Corp., regarding the sale to three insurance companies of $243,500 first 5s of Michigan Public Service Co.

•

Refinancing Plan Revived in Denver

Public Service Co. of Colorado has revived its refinancing plan. Stockholders of the company were notified that the corporation had called a special meeting for September 16 in Denver to act on a revised plan. After stockholders approved the former plan on December 12, 1938, the company filed its statement with the SEC, but withdrew it before the commission had an opportunity to act on it.

A statement by Guy W. Faller, vice-president and general manager, to stockholders said:

Your company desires to take advantage of the present low interest rates for money to refund its outstanding funded debt, which now consists of various classes of bonds and obligations heretofore issued, a substantial part of which bears interest at the rate of 5 per cent, 5½ per cent and 6 per cent per annum. All the details of the proposed refinancing will, among other things, greatly simplify your company's funded debt, reduced its annual fixed charges and provide suitably for financing the future growth and development of your company's business.

The company proposes to issue a total of $52,500,000 in first mortgage bonds and unsecured debentures.

•

$32,000,000 Issues Offered by Utility

Offering of $25,000,000 of bonds and $7,000,000 of debentures of the Central Power & Light Co. was recently made. Proceeds of this financing, together with other funds of the company in the amount of $1,773,968, will be used for the redemption of $32,045,200 principal amount of the company's first-mortgage 5 per cent bonds.

The new issue of $25,000,000 of bonds, which are first-mortgage 3¾s, Series A, due August 1, 1969, were priced at 101 and accrued interest. The $7,000,000 debentures, carrying coupons ranging from 1½ to 3 per cent, will mature semi-annually from August 15, 1940, to August 15, 1946, and were offered at prices to yield 1.25 per cent.

On completion of the refunding program, the funded debt of the company will consist of these two new issues.

•

Westerners Made Directors

Four nominees of the Harris Trust & Savings Bank, which recently took over operation of the Cities Service Power & Light Co., have been elected to the board of the utility company. The Harris Trust recently took over operations of the utility company under a trust agreement by the Cities Service Co. to obtain exemption from provisions of the Public Utility Holding Company Act.

The four executives named to fill vacancies on the board are all Middle Westerners. They are Gen. Robert E. Wood, Sears, Roebuck & Co.; Guy A. Richardson, president Chicago Surface Lines; Charles M. Thomson, trustee for Chicago & North Western Railway Co., all of Chicago, and Sutherland Dows, Iowa Electric Light & Power Co.

Utility Reports

	Net Income 1939	1938
*California Oregon Pwr.	$929,488	$900,916
*Columbia G.&E. & subs.	12,409,991	11,733,586
†Common. & South. & subs.	14,675,851	12,342,647
†Detroit Edison & subs.	9,791,683	7,061,190
*Duquesne Light	9,826,468	9,140,503
*Elec. Pwr. & Lt. & subs.	4,255,199	7,110,092
*Louisville G.&E. (Del.) & subs.	1,329,267	1,431,827
*Niagara Hudson Pwr. & subs.	7,621,892	7,405,710
*Pacific G. & E.	25,109,462	24,006,895
*Philadelphia Co. & subs.	5,838,814	5,486,169
*San Diego Cons. G. & E.	1,491,694	1,247,748
*United Gas Corp. & subs.	4,572,685	8,342,530

* Twelve months ended June 30.
† Twelve months ended July 31.

OPERATING PRACTICES

Photo Cells Signal Furnace Burner Outage

By C. E. MILLER
Engineer Potomac Electric Power Company, Washington, D. C.

In the operation of pulverized fuel boilers, particularly at low ratings, it is important that the operator know instantly when ignition fails. Loss of ignition can occur because of low furnace temperature, lean coal mixture or irregularities of coal feed. To guard against the hazard of blowing

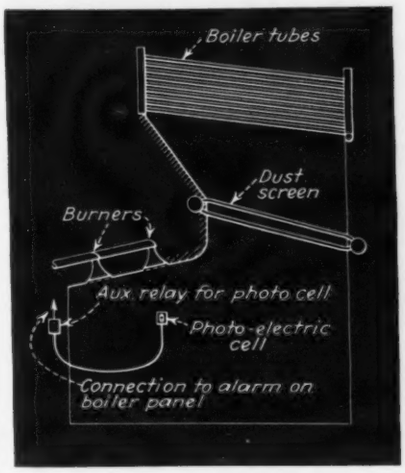


Photo cell looks at flame issuing from pulverized fuel burner and warns of cessation

unburned pulverized fuel into a boiler furnace, each boiler at Buzzard Point station is equipped with a photo-electric cell, so arranged that its source of illumination is from the furnace fire. This arrangement is shown in the illustration. If the fire goes out for any reason, the light source of the photo-electric cell is cut off, the relay operates and sounds an alarm to notify immediately the operator. Physically, the photo cell is so located to "look" at the fire approximately 3 ft. in front of the burners. In order to keep it from becoming excessively hot it is placed about 3 ft. outside the furnace wall, directly in line with one of the small observation doors.

•

Automatic Regulators Between Plants

By BERTRAM E. ELLSWORTH
Electrical Engineer
Iowa-Nebraska Light & Power Company
Lincoln, Neb.

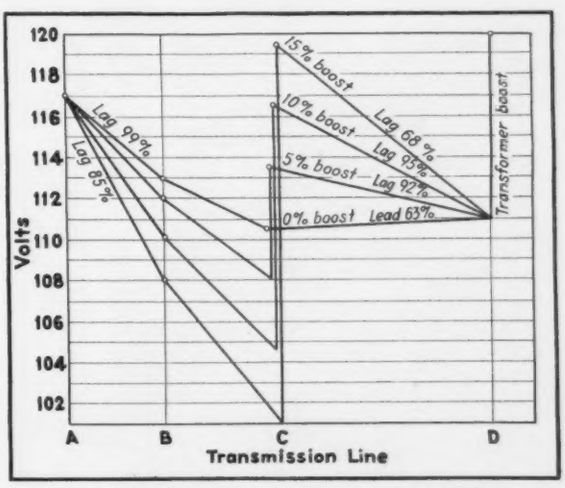
The increased use of automatic induction and step voltage regulators during recent years had led to a number of interesting operating problems. The application of an automatic regulator to a feeder is quite simple and is familiar to all engineers dealing with regulation problems. Application of automatic voltage regulators between power plants is something else. A great many have been installed, some operate properly and others do not. In many cases hand operation is resorted to when automatic performance goes wrong.

When a regulator is installed between two buses where voltage is automatically maintained constant it is not sufficient to calculate line and transformer drop and purchase a regulator sufficiently large to raise the voltage an amount equal to the line drop. Under this condition circulating or interchange currents are often much greater and cause much more change in voltage than do the power currents. This causes the calculations to be greatly in error.

Referring to the accompanying graph, where 117 volts is maintained at plant A and 120 volts at plant D, the regulator is located at C. The line and transformers connecting the two plants in question are assumed to have a very high value of resistance in comparison to reactance. This condition is very bad for a regulator installation, as circulating current, which depends on the reactance of the line, will be large in comparison with the power current.

The line is such that at an assumed load without a regulator the voltage follows the curve marked 0 per cent boost. (Values for all these curves were secured vectorially by combining load and circulating currents.) A voltage of 110.5 is secured at the regulator position (C) and 113 volts at a town located at some midpoint such as at B.

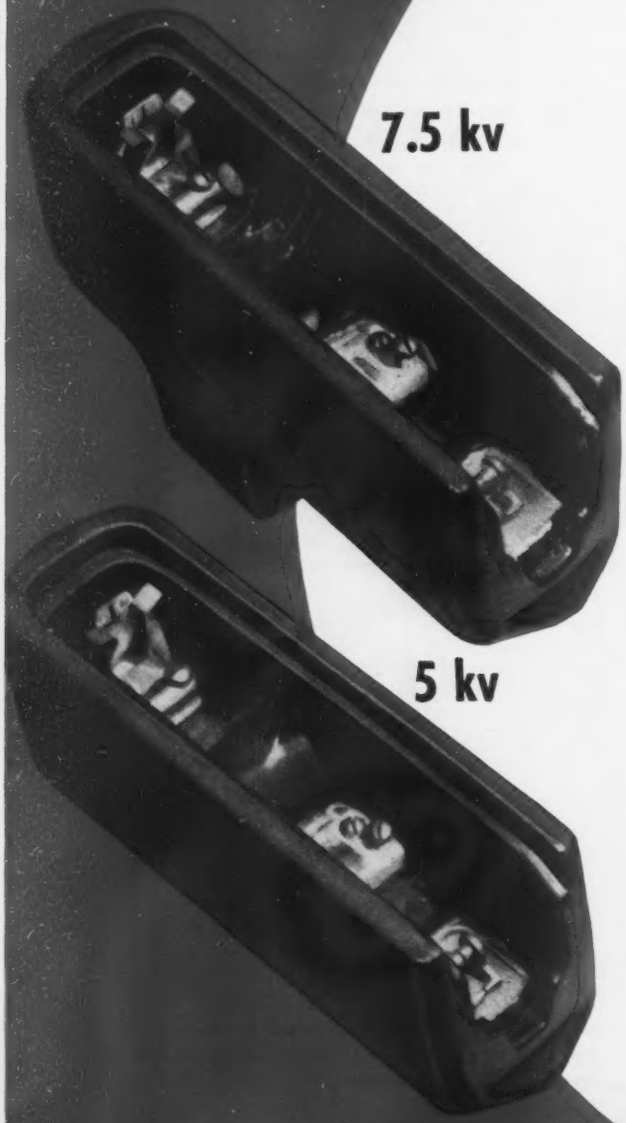
If the regulator is set to boost toward D and the contact making voltmeter asks for 116.5 volts, the



Voltage conditions for regulator settings between two plants connected by a transmission line

How many different cutouts do you carry?

SINGLE-ELEMENT door with selecting device for indication or dropout
TWO-ELEMENT, reclosing door with one-second time delay
DISCONNECT door with indicating and isolating feature



These 3 doors and these 2 housings . . .

meet 80% of your cutout requirements

IF you are looking for an opportunity to cut costs through lower inventories, fewer parts to handle in the stock room, and greater flexibility of cutout application, then we have a message for you.

It's this: You can take care of 80 per cent of your distribution fuse cutout requirements with just five major parts.

And the best of it is that you can adopt this simple program very easily. You don't have to stock all five of these parts immediately. Here's the way you do it:

First: You buy our 50-amp indicating and dropout fuse cutout in the 5- and 7.5-kv ratings. (Perhaps you're doing that now.) This gives you two housings to take care of all voltages not exceeding 8 kv (13.2 kv, Gr Y) across any one cutout. The doors are identical and interchangeable.

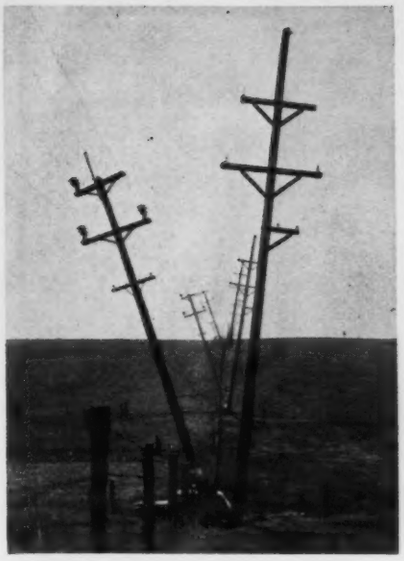
Suppose you are ready to use reclosing cutouts at sectionalizing points, on branch circuits, or at transformers serving important customers or located in out-of-the-way places. You have already installed G-E indicating and dropout cutouts. All you do is to take a G-E two-element *reclosing door* and send out a trouble crew to change doors. No line crew required. No installation costs. And it's the lowest cost, expulsion type.

What about disconnects? Simply take our new-design disconnect door. This, too, fits both housings. Furthermore, it has an indicating and isolating feature that saves time and makes for greater safety.

Two housings and three types of doors. General Electric is the only manufacturer that offers this stock-reducing, money-saving combination. Why not look into it today? General Electric, Schenectady, N. Y.

GENERAL ELECTRIC

340-8



"Rake" Hot 66-Kv. Line to Build New One

A number of important towns and substations on the Northern States Power Company system are supplied from the 66-kv. Sparta-Viroqua line, consequently it had to be de-energized when the time came recently to rebuild a section of it. As the illustration shows, the problem was solved by "raking" the poles in a 9-mile section, holding them at an angle with temporary guys while the new poles were set and conductors strung "in the clear" with the old line "hot."

regulator will go to 10 per cent before this voltage is secured, even though 116.5 volts is only 5.5 per cent above the starting voltage of 110.5 volts. This is due to changes in circulating current and to the drop between plant A and regulator C under the load conditions being studied. It will be noted that the voltage at town B has dropped from 113 to 110 volts.

If the contact-making voltmeter is set for 120 volts at C, it will be evident that the regulator will go to maximum boost and stay there, as 119.5 volts is the highest possible voltage it can reach (15 per cent regulator installed at C).

The power factors on the lines entering each plant are included and are of interest in showing the extreme range they cover. For any other load condition, a different family of curves will be secured. No general statements are offered relative to regulator operation between stations other than if the resistance of the line is high "watch out."

Mobile Transformers Serve Dual Purpose

By WALTER A. COXE
Field Engineer, Commonwealth Edison Company, Chicago

Transformers on trailers and trucks added to the regular equipment of the Commonwealth Edison Company have greatly facilitated restoration of service when transformers burn out or become defective. An unexpected use developed since acquisition of the transformer trailers has been that of maintaining service while replacing transformers or deteriorated structures.

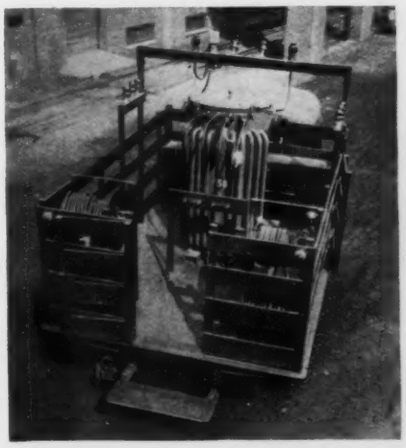
Of the 34,000 transformers on the 4-kva. radial distribution system supplying the city of Chicago about 1 per cent fail each year because of lightning, grounds on customers' equipment and internal faults. Because it is not always possible to parallel the load of a defective or burned-out transformer with an adjacent one, the company in 1928 installed three 300-kva. polyphase transformers on trailers which could be hauled to the location of the transformer that failed and connected in its place. Service restoration by means of the trailer saved on the average 3½ hours per customer affected. Because of this large time saving the company, in 1937, installed single-phase transformers on motor trucks for use in the same manner. During 1938 the use of the transformer truck saved on the average four hours and nine minutes per customer affected.

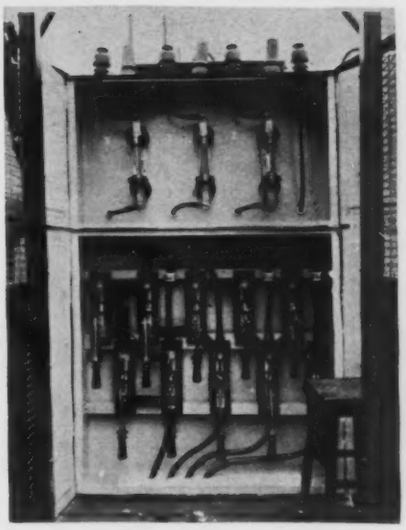
Having three trailers distributed through the city provided adequate facilities for quick service restoration. In addition, another use of the trailers has been developed—that of maintaining service during replacement of oil cutouts, transformers or deteriorated structures. The company's policy of not interrupting service to customers during replacement of company equipment requires that temporary transformers on a truck or temporary wires be strung to care for the customer's load. Use of the trailer in place of this temporary work has resulted in considerable savings:

1937—Trailer used 87 times—estimated savings—$3,015
1938—Trailer used 159 times—estimated savings—$6,736

(The greater use of the trailers the latter year was due to the addition of the transformer trucks.)

Savings, through the use of the transformer trailer, will pay for all the emergency equipment. The original cost of the trailers was approximately $3,500 each and of the trans-





Transformer trailers and trucks save many times their cost in providing inexpensive temporary service

Line Truck Provides Added Floor Space

Lynn Gas & Electric Company's latest type of line truck, a 3-ton outfit accommodating a maximum crew of six men, ready for work on a pole-setting job. The body is designed to permit carrying concentrated loads like distribution transformers, cable reels, etc., and the truck was laid out to keep the floor space as free as possible by the liberal use of compartments on the sides. The equipment includes a demountable derrick, jacks for heavy support work, pike storage facilities and extended supplies.

former trucks approximately $2,800 each.

Equipment on the transformer trailer consists of:

A 300-kva. polyphase transformer with special windings — 3,600/120/240 volts delta. A switching cabinet containing clips for liquid fuses and ten secondary, single-pole, single-throw disconnect switches, so connected to the secondary side of the transformer that with the proper primary connection voltages ranging from 120 to 480 can be obtained with various kva. capacities.

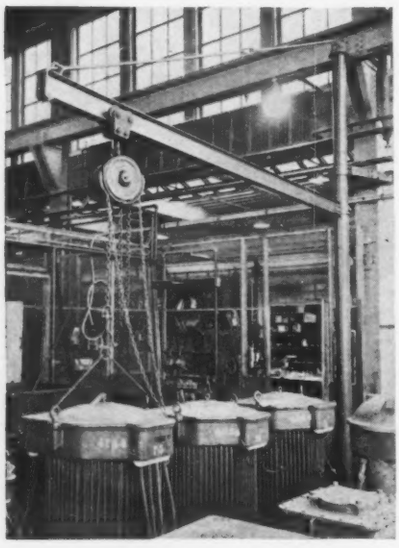
Equipment on the transformer truck consists of:

A standard 150- or 200-kva. transformer 2,080/120/240 volts and a fuse cutout mounted on a crossarm permanently installed on the truck.

Both the trailers and the trucks carry the following additional equipment:

One reel of 5-kv. No. 6 rubber-covered wires of sufficient lengths to connect the transformer to the primary feed. The wires are provided with pothead fittings and line connectors. Three reels of 350,000-circ.mil rubber-covered wire provided with lugs and secondary clamps for connection between transformer and busbar of customer's switch panel and the necessary rubber goods, fuses, tools and similar equipment.

Hoist Releases Cranes



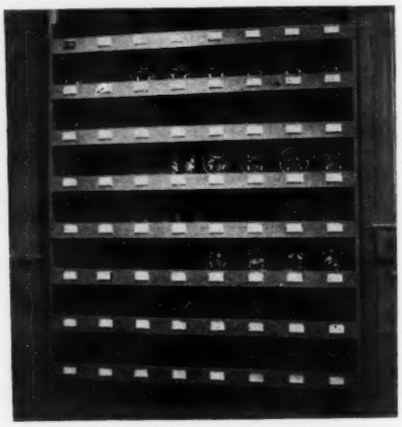
Maintenance of transformers of the distribution type is facilitated at the Melrose service station of the Narragansett Electric Company, Providence, R. I., by a 1-ton hand hoist which handles covers, coils and other equipment in supplementing the service of the horizontal traveling crane facilities of the buildings. A 15-ft. boom provides a satisfactory sweep for the bay in which this work is done and the hoist releases two 10-ton cranes for general service. Congestion is readily prevented in this busy section of the shop.

Meter Socket Rack Saves Storage Space

By WALTER H. MANECKE
Division Meter Superintendent
Wisconsin Public Service Corporation, Wausau

Bases for socket type meters are awkward things to pile; they won't stack together. Also, when one is wanted for a particular size conduit connection it may be hard to find in a pile on the floor. For these reasons the socket rack here illustrated was built in the Wausau meter department of the Wisconsin Public Service Corporation.

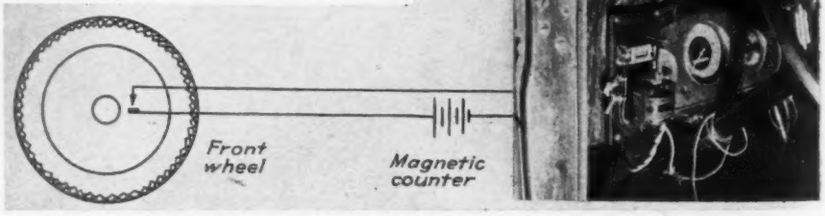
The rack is 8 ft. high, 6 ft. wide and 2½ ft. deep. It has no shelves, but in each level are eight pairs of wood pieces, each pair arranged in open bottom V section to hold eleven sockets standing upright. The rack thus has a capacity of 704 sockets, an ample supply. Each trough is labeled on the front of the rack to designate the sockets it holds.



Handy storage rack for meter sockets

Distance Meter Estimates Lines

One man in a car can read and record the location of poles, trees, fence lines, crossings, houses, etc., in line estimating work on the Empire District Electric Company of Joplin, Mo. For three years a "distance meter" applied to the dash has given highly satisfactory results and with negligible error. A contact attached to the front wheel sends impulses to a magnetic counter mounted on the dash.



Now No. 1799 Becomes the G-E Standard for Varnished-cambric Cable

New Savings, Longer Life—
No Increase in Price

I. P. C. E. A.
No. 1799 meets the new I.P.C.E.A. specifications for Varnished-cambric-insulated Cables (Fourth Edition, July, 1939).
Bulletin GEA-3215 contains the new operating temperatures.

THE new G-E heat-resisting varnished cambric, No. 1799, has now become the G-E standard—thus making available a special product at no extra cost.

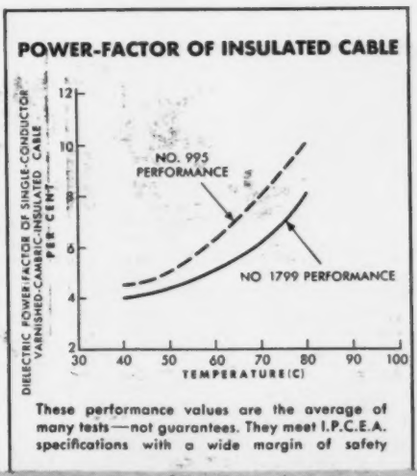
The obvious superiority of No. 1799 led to this decision. Its superiority lies in the combination of heat resistance *plus* high dielectric strength and low dielectric (power-factor) losses. See curve for example; other values are given in Bulletin GEA-3215.

Lower Cost

Cable insulated with No. 1799 can be run at a conductor temperature of approximately 10 C higher than cable insulated with No. 995 varnished cambric, our previous standard.

This means new savings, by making it possible to reduce conductor size and thus copper—particularly on low-voltage lines—with corresponding reductions in first cost, over-all diameter, shipping weight, duct space, and other respects.

But this is not all. In addition, a new process of cable manufacture has greatly improved the dielectric power-factor of our varnished-cambric cable and has added years to its life.



These performance values are the average of many tests—not guarantees. They meet I.P.C.E.A. specifications with a wide margin of safety

A Good Product Made Better

No. 1799 supersedes No. 995 varnished cambric, our standard for many years. Cable insulated with it has a fine performance record. Fortunately, therefore, our engineers did not have to throw No. 995 into the discard. They retained the same special G-E cloth, "unsized" to assure thorough impregnation. They kept the asphalt base, but with it obtained a superior varnish. They made other detailed improvements. And the resultant insulation, No. 1799, is the new standard for G-E varnished-cambric cable—*at no increase in price.*

Bulletin GEA-3215 gives details. For a copy and a sample of No. 1799, address the nearest G-E sales office, or General Electric, Dept. 6-201, Schenectady, N. Y.

GENERAL ELECTRIC

520-183

INDUSTRIAL ENGINEERING

Photo-Electric Relay Controls Belt Conveyor

Empty bottles come to the plant of the Campana Corporation at Batavia, Ill., in the same reshipper cartons in which the packaged bottles are sent to customers. Photo-electric controls play an important part in the automatic and orderly transfer of these cartons from the point at which the empty bottles are removed to the point where the packaged bottles are packed in for shipping.

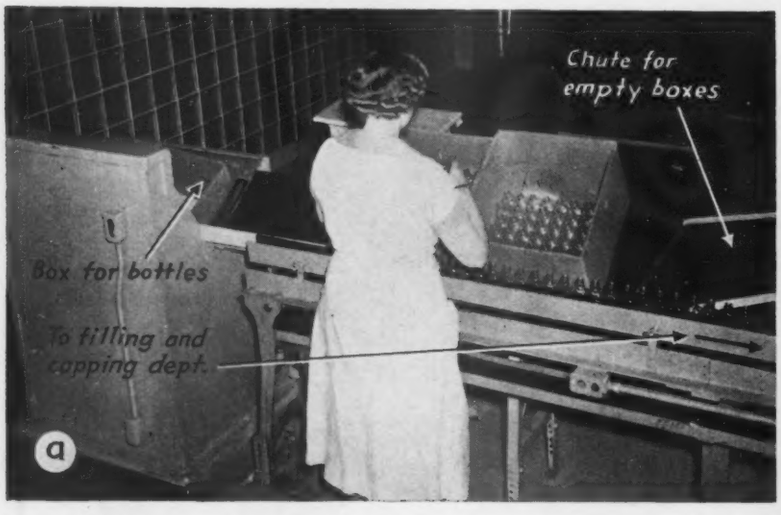
As the operator removes the empty bottles from the reshipper cartons she pushes the empty carton into a chute leading to a conveyor which passes just under the packaging room floor (to keep dust out of the packaging room). The control operates on this conveyor at the point where it transfers the extremely light cartons to a vertical booster or small elevator that raises them to the second floor as they are needed on the packaging line.

Light weight of the boxes made it necessary to use light beams and photo-electric relays rather than limit switches to start and stop the conveyor and prevent it from discharging boxes onto the shipping room floor when the booster or elevator was in the "up" position and not ready to receive cartons from the conveyor.

Two light sources, two mirrors and one standard photo-electric relay are required for the scheme as used at this plant. The beam from one light source shines directly across the conveyor to a mirror on the opposite side and thence to the photo-electric relay. The second light beam is controlled by a limit switch and is on only when the booster-elevator is in the "down" position ready to receive a box from the conveyor. This second beam shines across the booster to a mirror and back to the same photo-electric relay. The relay is arranged so it allows the conveyor to operate as long as it is receiving light from one or both of the two light sources.

In operation, as a box approaches the end of the conveyor and the booster is "down" in a position to receive it, both light sources will be delivering light to the photo-tube, and even though the box cuts off the first beam the second light source will still direct a beam to the relay, and the conveyor will deliver the box to the booster. However, if two boxes come close enough together to cut off both beams or if the carrier is in the "up" position (cutting off the second light source) the conveyor will stop before the box reaches the end. A solenoid brake on the conveyor motor stops it quickly.

When the booster receives an empty carton, the weight of the carton depresses a delicate micro-switch which closes a contact to energize the



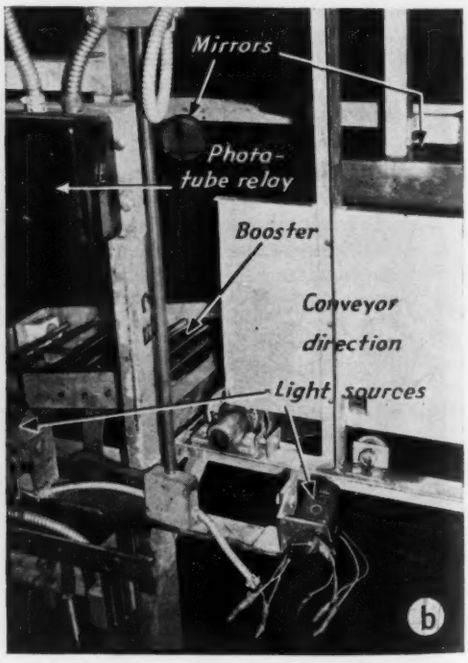


Photo-electric control is key to automatic box transfer scheme
Empty boxes pass down chute at right in (a) to conveyor which carries them to booster shown in (b). Light beam control stops conveyor when booster is not in position to receive box.

Making a Voltage Survey?

Here's a NEW Recorder for That Job

IT'S INKLESS, IT'S LIGHTWEIGHT, IT'S LOW-PRICED (ONLY 12 LB)

TYPE CF-1
Voltmeters (also Ammeters)
For Indoor or Outdoor Use
Portable—Pole or Wall Mounting

SPECIAL
FOR VOLTAGE SURVEYS

To attain still higher accuracy over a wide temperature range, Type CF-1 voltmeters are stocked as single- and double-range instruments (rated 0-140 and 0-140/0-280 volts) with temperature compensation for the 0-140-volt range.

THIS new INKLESS recorder—General Electric's Type CF-1—gives accurate, easy-to-read records under all ordinary conditions and also in many cases where ink recording is unsatisfactory. It's a sturdy inexpensive recorder, and its special features make possible many advantages.

NO INK TO SPILL — NO PEN TO CLOG

Because it's inkless, there's no possibility of "painted" or blurred records. No worry about ink evaporation or freezing—you can be sure of successful operation in temperatures from −10 F to 120F. And, under extremely fluctuating loads (where ink recorders would "paint" the chart or blur), you're assured accurate records of actual operating conditions.

WEIGHS ONLY 12 POUNDS

The Type CF-1 is small and light. It is less than half the weight of the conventional recorder. It's easy to carry, easy to handle.

FOR OUTDOOR OR INDOOR SERVICE

You can put these recorders to work inside or outside, as portables, or mount them on walls or on poles. And, where frequent servicing is impractical, they offer the advantage of continuous and service-free operation for as long as 30 days. Complete details are contained in Bulletin GEA-3187. Call the nearest G-E office or write General Electric Company, Schenectady, New York.

HEADQUARTERS FOR ELECTRICAL MEASUREMENT

GENERAL ELECTRIC

430-151

Weather no longer handicaps this job *The Austin Company*

raising motor. The carton is then automatically raised to the "up" position and after it is removed the booster automatically descends to the receiving position ready for the next carton.

The conveyor is built in two sections. The part most remote from the booster is 65 ft. long and operates at 20 ft. per minute, that nearest the booster operating at 80 ft. per minute. Faster speed of this section acts to space the boxes.

•

"North" Light Provided for Saw Straightening

To insure that plane surfaces are provided on circular saws which operate at high speed, "north" light has long been a requisite, both for straightening on the anvil and in looking for light under a straight edge in checking the flatness of the disk.

When the Simonds Saw & Steel Company built its windowless plant at Fitchburg, Mass., where a single manufacturing room covering 5 acres depends entirely on artificial light, it became necessary to provide the equivalent of north light at all hours in place of utilizing daylight in the department of the Simonds factory where the skilled job of smithing such saws and other precision tools is handled.

The installation was worked out by covering the area devoted to smithing with black canvas canopies to shut out the direct light provided by the 1,400 100-watt G. E. fluorescent tubes which blanket the 5-acre room with even, shadowless light. The north light effect is obtained by a supplementary installation of 100-watt tubes mounted about 8 in. behind panels of flashed opal glass. In the smithing section illustrated, which is about 30 ft. long x 15 ft. wide x 9 ft. high, two six-section panels, 7 ft. wide x 5 ft. high each, are furnished each with three 55-in. tubes set horizontally behind the glass. Below each panel at the left is a two-section unit behind which are two tubes extending 2 ft. upward behind the larger panel, to facilitate scrutiny of the saw surface when held vertically. Thus ten tubes of 1,000 watts total rating illuminate the anvils and also provide uniform light for testing the quality of the plane surface in both horizontal and vertical positions, at all times independent of outside weather conditions.

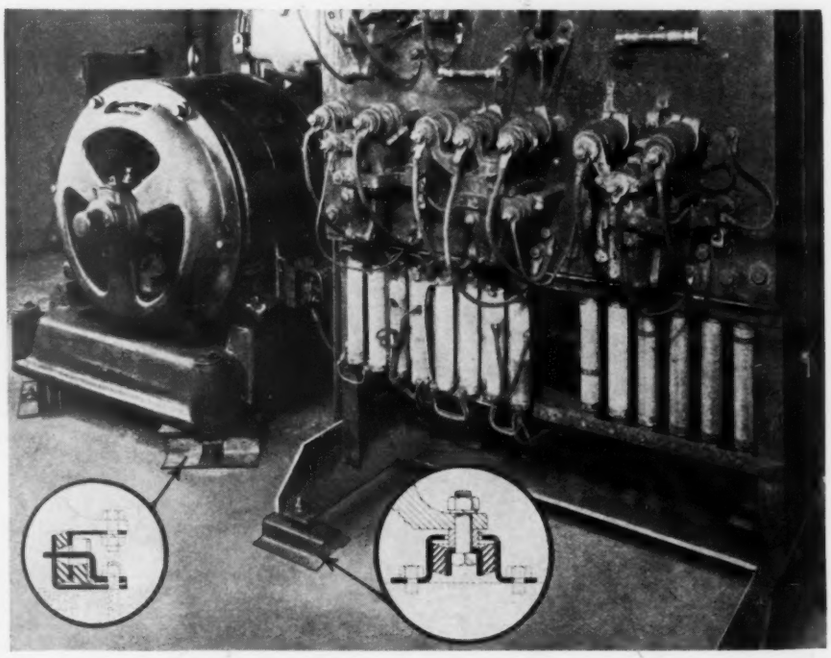
•

Rubber Mountings for Circuit Breaker Panel

Use of rubber mountings on the circuit breaker panel, the electric motor unit and the elevator assembly at the Indian Village Manor apartment house in Detroit, Mich., has eliminated the noise of the elevators throughout the buildings and has prevented the sharp jerkings which occurred when the elevators stopped and started.

Previously the elevator installation was mounted on cork pads. After some service the installation became noisy and the vibrations transmitted the noise through the building to the tenants of the apartments on the lower floors. It was essential to prevent the transmission of vibration from the elevator equipment to the building structure.

Control panel is now mounted on four lengths of type 100 U.S. Royal mountings, loaded to approximately 30 lb. per linear inch, while the motor and elevator assembly are mounted on ten type 200 U.S. Royal mountings, each loaded to approximately 750 lb.

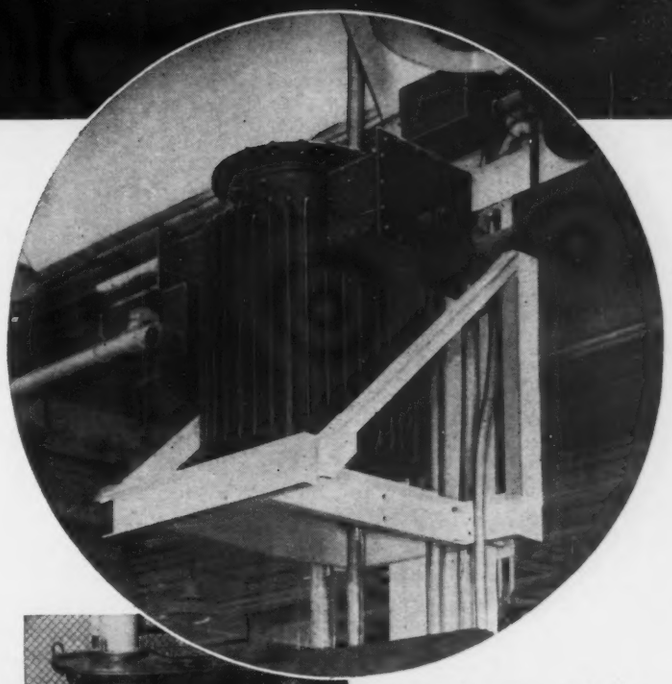


Rubber mountings for elevator breaker panel and motor minimize vibration propagation

G-E Pyranol Transformers

Offer NEW SOLUTIONS

to Many Factory and Commercial Distribution Problems



PROBLEM 1
MODERNIZATION OF FACTORY LIGHTING

In one case, the engineers were asked to increase lighting levels on a factory floor to between 25 and 35 foot candles. The existing lighting circuit, which was 600 feet long, ran from a substation outside the building. To handle the increased lighting load with old methods would have required a new and larger transformer outside the building and new and larger secondary copper inside. Pyranol transformers provided a new solution to this problem that utilized the existing wiring and resulted in savings of 40 per cent.

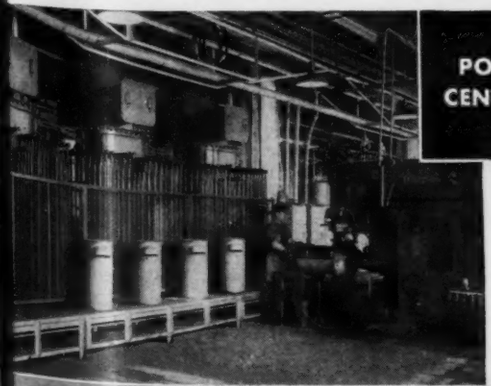
The old wiring was split into three sections, and a small Pyranol transformer was installed at the center of each section. The expense of running new secondary copper was avoided; voltage regulation was better and power losses lower than they would have been on the long circuit.

Up near the ceiling, out of the way, is one of the Pyranol transformers that made possible savings of 40 per cent in the cost of modernizing a factory lighting circuit

PROBLEM 2
AIR CONDITIONING IN OFFICE BUILDINGS

The installation of air-conditioning equipment in buildings frequently presents a problem in power distribution that can be answered economically by Pyranol transformers. The Pyranol transformer shown at the right is installed on the third floor of the Equitable Building in Des Moines, Iowa, to supply an air-conditioning load on that floor. Because Pyranol is noninflammable, the transformer could be installed without a vault, at a convenient location near the load center.

Greater safety, plus savings in the over-all cost of transformer installations, makes Pyranol transformers the most practical and economical transformers for office buildings, theatres, hospitals, and other public buildings



PROBLEM 3
POWER FOR CONCENTRATED FACTORY LOAD

Welding machines in the Pittsfield Works of General Electric required power at 575 volts. Floor space was at a premium, and this fact made it impracticable to build a fireproof vault near the load center and install oil-filled transformers. Pyranol transformers—three of them, each rated 635 kva, 13,800 v—provided the answer and reduced the over-all costs of the installation.

For your installations, it will pay you to investigate the possibility of savings with Pyranol transformers. Ask your G-E representative for complete information, or write for Bulletin GEA-2637. Address General Electric, Dept. 6—201, Schenectady, N. Y.

GENERAL ELECTRIC

300-71

NEW ENGINEERING IDEAS

Key "Telephoned" with Cyclometer Lock

By J. E. GOODALE
Manager Substation Operations Department,
Consolidated Edison Company of New York

Combination locks are being used as a contribution to safety in the activities of the Consolidated Edison Company of New York, Inc., on its distribution system. In effect the cyclometer type of locks adopted provide the equivalent of a telephoned key. Particularly does the program afford the opportunity to use individual "keys" on each piece of equipment, a procedure previously not considered practicable on a large system. It is expected that the resort to combination locks will provide a further final check against mental lapses of highly qualified men who, however, become accustomed to routinized repetitive functions and occasionally make a false move.

The objective of this particular application is to prevent an employee from operating any switch other than the particular switch which is intended to be operated. The type of lock which has effectuated the gain in safety is the Sesame lock of Bemis & Call, Springfield, Mass. It has four cyclometer dials and can readily be set to the combination which agrees with the "key" number assigned to a specific switch. Closing the shackle relocks it and simultaneously disarranges the combination, requiring that it be redialed again to open the lock. Sequential operations present another application for this type of lock, the opening of one lock disclosing the combination for the lock controlling the next operation.

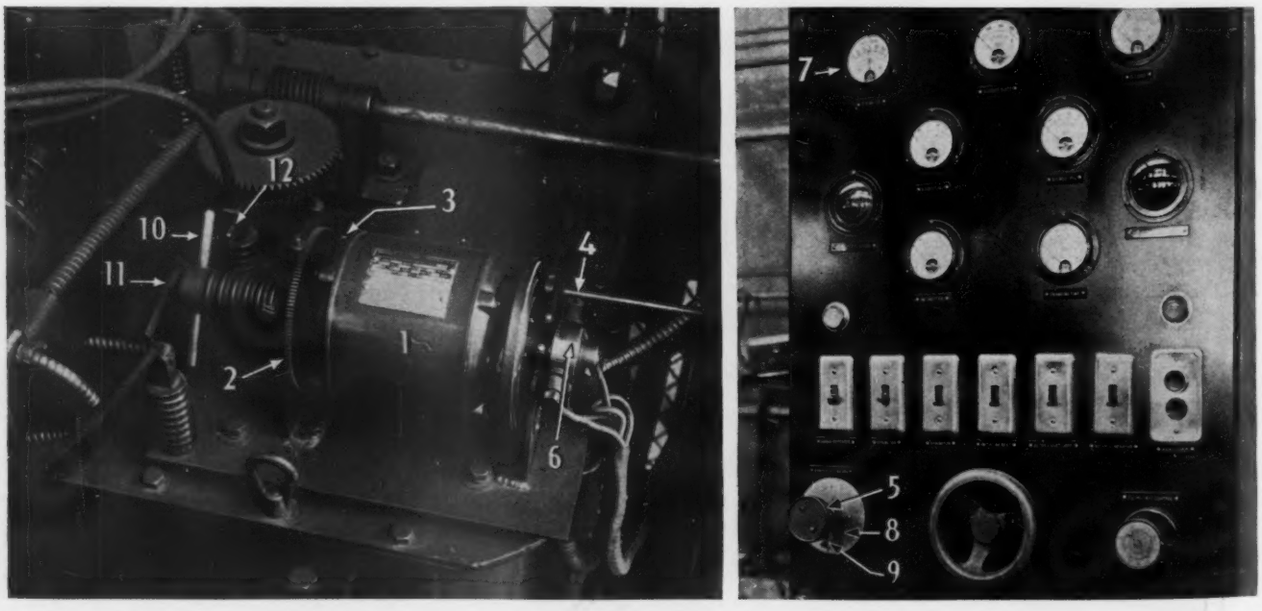
In practice the district operator has jurisdiction over the operation of all transformer grounding switches and has on file a list of each transformer location with its corresponding lock combination. To the field crews the district operator issues, by telephone, switching orders which include the transformer location and the lock combination number. If the employee enters the wrong manhole or vault, he will be effectively blocked in performing any operation because the lock combination will not agree with the number telephoned to him.

•

Synchronizing Surge of a Test Generator

By H. WEICHSEL
Consulting Engineer
Wagner Electric Corporation, St. Louis, Mo.

Use is made of a synchronous motor to synchronize a surge from the 2,000,000-volt, 36,000-amp. surge generator with the 60-cycle power current in the testing laboratories of Wagner Electric Corporation. Engineering details of the arrange-



Synchronous motor and control board aid in synchronizing surge of test generator

$50,000 Substation Investment Postponed

HOW AN OHIO UTILITY PROFITED FROM THE USE OF PYRANOL CAPACITORS TO IMPROVE POWER-FACTOR

Capacity was needed

In 1937, growing load on the substation and feeders serving the downtown area of Warren, Ohio, made it necessary for the Ohio Public Service Company to provide additional capacity. A study showed that the location and layout of the existing substation would not permit the addition of new capacity at the station. To expand facilities would have required the building of a new substation on the other side of town—the only place where a suitable site was obtainable.

Capacitors were applied

Further analysis showed that this investment could be forestalled, and profitable handling of the load growth assured for one year, by an installation of shunt capacitors on the feeders. Such an installation, by improving power-factor, would release capacity that was loaded with reactive kva.

Subsequently, a total of 360 kva of G-E Pyranol capacitors was installed, resulting in the release of 206 kva of existing substation capacity. The installed cost of the capacitors was $3325.

The resulting profit

Since the saving in carrying charges on the forestalled substation investment was $6500 in the first year, the capacitors fully paid for themselves in about seven months.

This was entirely aside from savings on other items, such as the generating and feeder capacity released for new load, and the increased revenue which resulted.

Investigate for yourself

Opportunities exist on most systems today for the profitable application of G-E Pyranol capacitors. If there are overloaded substations or feeders on your system, it will pay you to investigate this economical, reliable means of releasing capacity. Reduced voltage drop and reduced losses are other benefits that usually follow the installation of capacitors. Ask your G-E representative for complete information, or write for Bulletin GEA-2746, *Pyranol Capacitors for Central Station Applications*. Address General Electric Company, Dept. 6—201, Schenectady, N. Y.

HOW RELIABILITY IS BUILT INTO PYRANOL CAPACITORS

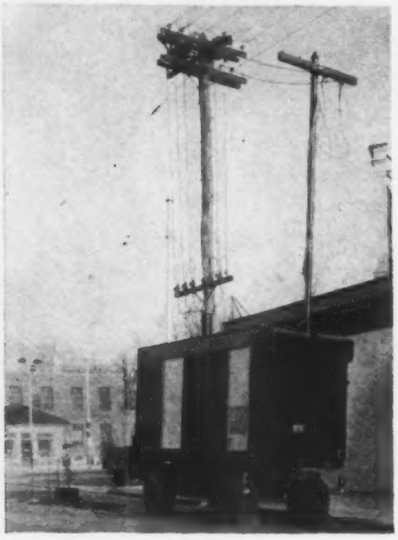
Thorough testing of G-E Pyranol capacitors during the entire manufacturing process is a major reason for the reliability of these units in service. In the test illustrated at the right, the units are placed in a special oven, where the effectiveness of their hermetic sealing is tested by a combination of pressure and high temperature.

The G-E ten-million-volt lightning demonstration at the New York World's Fair uses 102 Pyranol capacitors, each rated 100,000 volts

GENERAL ELECTRIC

360-143

Portable Transformer Bank Carries Connection Pole



A valuable feature of this 150-kva. portable transformer substation of the Boston Edison Company, used for both temporary and emergency service, is a steel pole 6 in. in diameter and 14 ft. long which is surmounted by a six-pin crossarm bringing the lead take-off about 25 ft. above ground. The pole is attached to the truck frame by a hinged socket which enables it to be stowed in a horizontal position during transit. Mounted on a trailer that can be towed from either end and weighing 20,600 lb. complete, this unit is equipped to transform energy received at 4 or 2.3 kv. to 115, 230, 460 and 575 volts. Single-phase or three-phase energy is available. A switchboard on the truck includes a main circuit breaker and the customary instruments.

ment are presented in the accompanying illustrations.

The synchronous motor is wound for three phase to give it better starting conditions and a more uniform speed than can be obtained from a single-phase synchronous motor. The rotor has pronounced poles and is provided with a squirrel-cage winding; it is therefore a so-called "reaction-type synchronous motor."

So that it can be rotated around the axis of the machine, the stator (1) is provided with a gear (2) engaging with a pinion (3) mounted on a shaft (4) which is provided with a hand wheel on the control board (5). On the rotor shaft is also mounted a commutator (6), all segments of which are dead with the exception of two diametrically opposite segments which are interconnected. A capacitor is connected across the terminals of a voltmeter (7) which has its zero point in the center of the scale.

While the voltmeter reading can be used to indicate the phase relation at which the surge strikes, more accurate readings are obtained from the dial (8) on the control board, which is graduated in degrees and indicates the position of the stator, the scale being so graduated that zero reading means that the surge strikes when the power voltage is zero. If the scale reads 90 deg. it means that the surge strikes when the power voltage is at its maximum. Deflection of the voltmeter to right or left of its zero point indicates that the surge strikes on the negative or positive half-cycle of the wave.

The voltage feeding the voltmeter is taken directly from the supply terminals of the transformer under test. In this circuit are also connected in series the two brushes belonging to the commutator (6). Hand wheel (5), used for moving the synchronous motor field, is also provided with a "hand" (9) fastened by friction contact to the pinion shaft. The wheel is moved until the indicating voltmeter reads zero, then the adjustable hand is moved to coincide with the zero point on the dial. This method of adjustment assures that the phase angle read by the dial is correct for the test set-up; with careful adjustment, accuracy of the phase angle within two electrical degrees can be obtained.

Rotating gap consists of a brass arm (10) or rod with hemispherical tips. The center of this arm is insulated from and mounted on the synchronous motor shaft. By friction contact (11) the center point of the rod is connected to one side of the high-voltage tripping circuit. A stationary contact (12) is in series with the main tripping circuit and is excited when one end of the rotating arm is opposite the stationary contact.

• • •

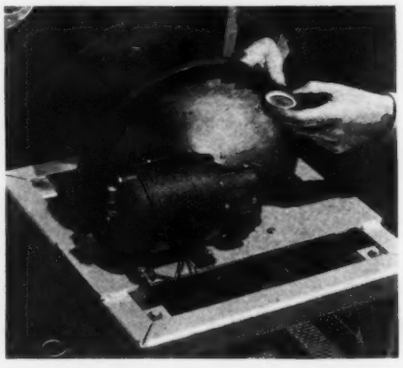
Fulchronograph Records Full Lightning Stroke

Measurement of both the magnitude of current and time of a full lightning stroke has been completely recorded atop the Pittsburgh Cathedral of Learning by a new Westinghouse device called the fulchronograph.*

Essentially this instrument is a motor and a slotted aluminum wheel filled with laminated permanent magnet steel projecting like fins from each side of the rim of the wheel and rotating between two coils which carry the total surge current from the lightning stroke being measured. Current in the coils produces a magnetic field proportional to the surge current at any instant, and the magnetic steel slot or fin passing in that field is magnetized in proportion to the amount of current that is carried by the stroke in time divisions as brief as 40 millionths of a second.

There are two recorder units in use at the Cathedral lightning station. One is a high-speed wheel containing about 400 iron fins and rotating at more than 3,400 r.p.m., completing a cycle in about one-sixtieth of a second. The spacing of the fins and the rapidity of the wheel enable it to make a record every 40 microseconds, resulting in a schematic picture of the wave shape and surges of a single lightning stroke. The second wheel is relatively slow in comparison, revolving only once every second and is capable of making a record on its fins every 2,400 microseconds to determine the magnitude and sequence of lightning bolts when more than one strike in the same place. This slow-motion device gives the crest value of each stroke, separates the strokes and enables the investigators to analyze the multi-stroke impressions on the high-speed wheel.

Both the high-speed wheel and the low-speed wheel are calibrated by means of a lightning surge generator in a high-voltage laboratory by comparing the magnetic reaction of the steel fins to an artificial lightning surge and the wave shape of the surge as reproduced by a cathode-ray oscillograph.



Compass checks magnetism in recording wheel of the fulchronograph

Before the fulchronograph was devised the most effective means of measuring lightning was the oscillograph, which responds almost instantly to changes in current and voltage, using these changes to move an electron beam and etch a picture of the lightning stroke on a photographic film. But it is limited in its ability to record wide ranges of current over a long period of time. The fulchronograph costs less than 5 per cent as much, is sturdier and simpler to operate and covers a current and time range 100 times greater.

* Performance of the fulchronograph is related in "Direct Stroke Proves Length of Lightning Tail," by C. F. Wagner and Edward Beck, ELECTRICAL WORLD, July 29, 1939, page 37.

GENERAL ELECTRIC OFFERS

THE NEW STANDARD GRADES

G-E RUBBER-INSULATED BUILDING WIRE

(Approved by Underwriters' Laboratories)

General Electric Building Wire meets and surpasses the Underwriters' requirements for the insulation used on these four grades of wire. It is marked for quick identification of insulation, size, type and voltage. It is uniform, dependable, easy stripping, clean stripping and easy to pull. Diameters are uniformly small.

For further information on G-E Building Wire see the nearest G-E Merchandise Distributor or write to Section W-9118, Appliance and Merchandise Department, General Electric Co., Bridgeport, Conn.

GENERAL ELECTRIC

SEE THE "HOUSE OF MAGIC"

LOAD BUILDING

Electrical Baking Improves Product

By W. B. CHENEY
Industrial Heating Engineer Southern California Edison Company, Ltd.

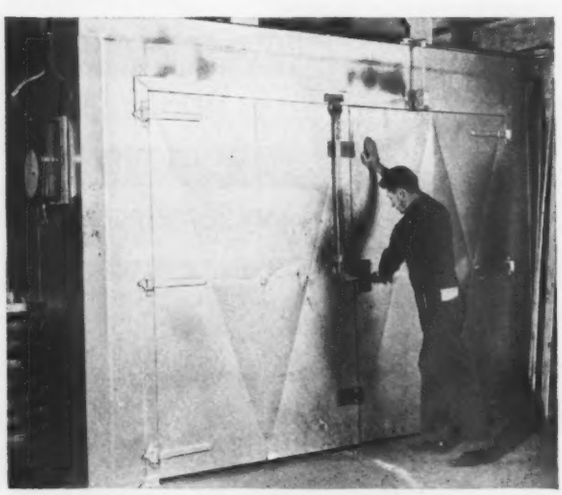
When the Utility Fan & Manufacturing Company of Vernon, Calif., decided to put a baked-enamel finish on its "Dezert Kooler"—air-cooling device used successfully in arid regions—the many advantages of electric heat led plant engineers to specify an electric oven for the baking operation.

The company installed a 12 x 12 x 8-ft. oven, insulated with 3 in. of rockwool, equipped with internal ventilating ducts and an exhaust fan. Heating elements consist of 45 kw. of oven-type heaters.

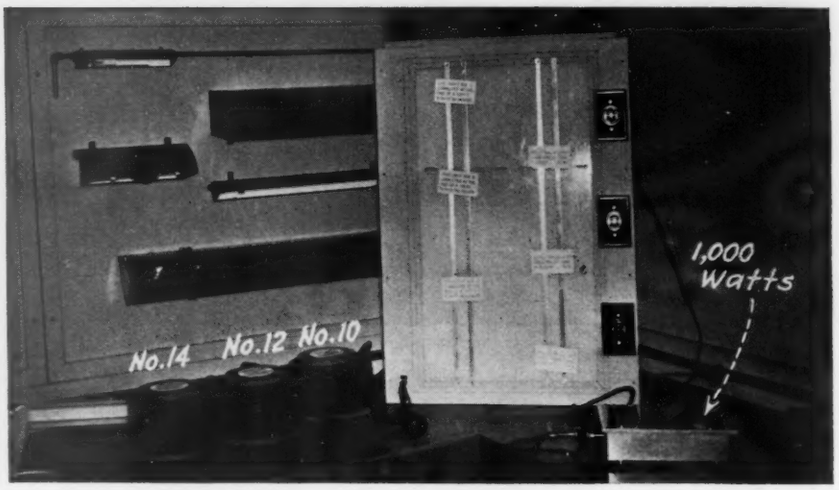
Several months' operation has yielded very satisfactory results. The oven turns out 2,000 lb. of steel in one hour, maintaining baking temperature between 275 and 300 deg. F., and recovers temperature within fifteen minutes after a fresh 2,000-lb. charge is placed. After an overnight shutdown temperature is recovered in about 30 minutes.

Installation of a recording thermometer has enabled the superintendent to obtain a picture of oven operation during times when he is not present. This is especially convenient when the plant operates on two shifts and affords a record of charges handled, time of bake, time required for changing charges, as well as temperature.

The user has stated that the extra cost of the graphic instrument is more than offset by the benefits which have been obtained from this form of supervisory control.



45-kw. oven used by Utility Fan Company at Vernon, Calif. Recording thermometer at left presents a 24-hour picture of operations



Light box demonstrates loss of light from inadequate wiring

Show Light Lost by Undersized Wire

Loss of light caused by inadequate wiring is effectively demonstrated to customers of the Commonwealth Edison Company, Chicago, by means of a simple light box scheme set up in the lighting sales display room. Lighting engineers report that this device is much more effective than words in explaining the undesirable effects of inadequate wiring to non-electrically minded customers.

The device consists of three light boxes in one frame, each housing a single 25-watt lamp and connected to the lighting 110-volt circuit through a 100-ft. coil of wire. One box has 100 ft. of No. 14 wire, another 100 ft. of No. 12 and the third 100 ft. of No. 10 wire in the circuit. An outlet on each box provides for connection of a 1,000-watt "hotplate" in parallel with the lamp. As the 1,000-watt load is applied the dip in light intensity is readily noticeable and, of course,

varies with the size of wire in the circuit of that box.

The percentage of light reduction when the 1,000-watt load is connected has been previously determined and noted on a card attached to the light box concerned. For the top box (No. 14 wire) it is 20 per cent, for the middle box (No. 12 wire) it is 16 per cent, and for the bottom box 10 per cent.

•

Tabloid Stimulates Central Hudson Sales

As a practical means of creating and sustaining customer prospects, particularly in the scattered rural areas, officials of Central Hudson Gas & Electric, Poughkeepsie, N. Y., attach great importance to a monthly tabloid-size news-sheet issued by the company.

Twenty-five thousand of the company's 60,000 residential customers are rural, and strictly rural because they live outside even the villages and towns of the territory.

To reach these people regularly and at reasonable cost the company mails out its free monthly "Gas and Electric Family News" a one-sheet, four-page pictorial presentation.

The content of the tabloid varies from month to month in accordance with the company's sales campaigns. But the method of presentation never varies in that it constantly talks in picture form about the customers and what they are doing. In every picture the customer is doing something which revolves around a recent appliance purchase.

Pictures of housewives and their children predominate, names and addresses of all are printed in catchy captions and the company now hears of prospects who want to know if they will get their pictures in the paper if they sign up. Photographs are taken in the kitchens of the customers by a company employee and no fees are proffered in either direction.

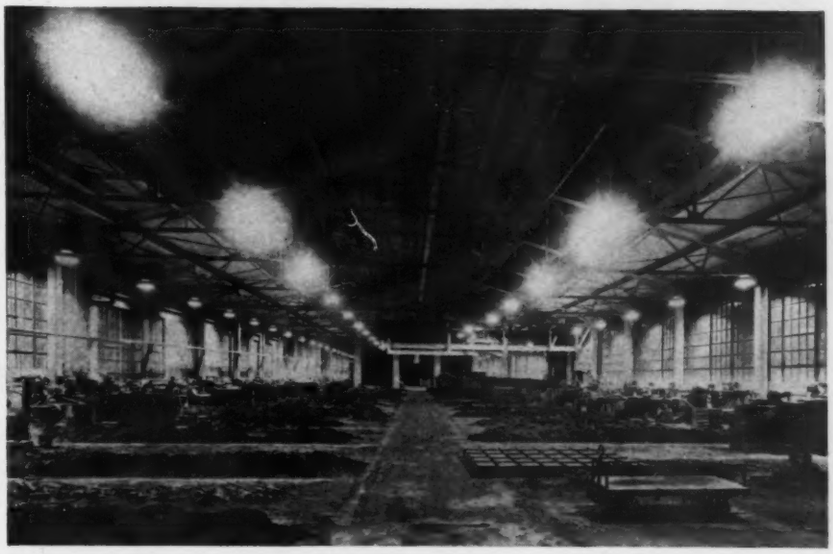
No stodgy utility house organ, the tabloid adopts current fads and runs cross-word puzzles, jingle contests, quizzes, question boxes, etc. In a recent jingle contest, dedicated to the attractions of modern electric refrigeration and involving ten admissions to the World's Fair as prizes, several hundred children from a single school participated.

GAS AND ELECTRIC
FAMILY NEWS
The Picture Paper of the Central Hudson Valley
LATEST NEWS
LATEST PICTURES
Vol. II, No. 6 — CENTRAL HUDSON GAS & ELECTRIC CORPORATION — May, 1939
NICKELS GUARD HEALTH
CHEERFUL CHERUBIC CHILDREN
Guard your health and that of your children the easy NICKEL way.
WORLD'S FAIR CONTEST
PAGE 4
on page 2 see how YOU can buy a Refrigerator for NICKELS

Tabloid tells prospects

Central Hudson Gas & Electric mails four-page tabloid picture paper to rural customers to apprise them of current appliance campaigns and to show them how many more Mrs. Jones's have taken on another electric servant.

80 Ft.-Candles for Foundry



A handbook of one of the major lighting companies published in 1920 recommends 3-9 ft.-candles for fine foundry work. The Wisconsin Appleton Company of South Milwaukee has 80 ft.-candles on the moulding benches. This illumination is secured by the use of Holophane reflectors made especially for the new 400-watt mercury lamp. Mounting height is 16 ft., spacing 16 ft.

•

Commercial Lighting Sold on Its Value

By H. G. HRIVNATZ
Lighting Engineer Houston Lighting & Power Company

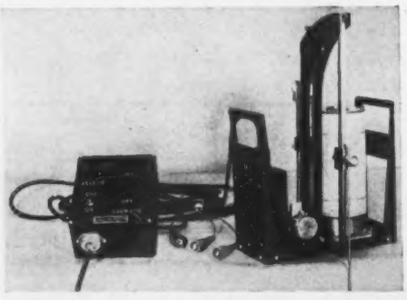
INCREASED lighting in existing commercial installations totaling 2,137.77 kw. plus 2,183.82 kw. in new ones gave the Houston Lighting & Power Company an E.A.R. of $202,-833 in 1938. This business was brought in by fourteen all-purpose salesmen and the approximate cost was $14 per kw., or a little less than 30 cents per dollar of E.A.R.

This result was obtained by continuous, consistent, plugging away on the theme that the function of lighting in stores is not just to allow customers to see their way around, but to show merchandise so attractively that customers will want to buy it. The company does not sell or install commercial lighting units and fixtures. This work is done by cooperating dealers and contractors.

NEW EQUIPMENT

Circuit Breaker Analyzer

An instrument which graphically records the mechanical operations of oil circuit breakers is offered by this company as an aid to the maintenance man in making



Circuit breaker operation analyzer. **The Cincinnati Clock & Instrument Co.**, 1117 Harrison Ave., Cincinnati, Ohio.

proper adjustments at overhaul times and to give a permanent office record of the mechanical condition. It may be used also in making acceptance tests on new equipment. Vertical drum carries a ruled chart, driven by a synchronous motor through gear reduction, and pencil slider is operated through a reducing mechanism by the lift rod of the oil circuit breaker. Rotary motion of drum gives time in cycles as the abscissa, while the ordinate of the chart represents travel of the circuit breaker contact mechanism.

Fluorescent Unit

"Hygrade HF-100"; with two 40-watt, 48-in. fluorescent lamps; for operation on 115 volts or 230 volts, 60 cycles a.c. **Hygrade Sylvania Corp.**, Salem, Mass.

Offered for industrial and commercial service, this new fluorescent lighting unit is corrected for power factor and is said practically to eliminate stroboscopic effect. It uses two of the 40-watt, 48-in. fluorescent lamps.

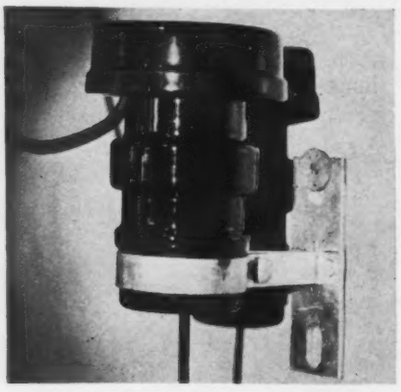
Construction Sign

"Hi-Boy Swing Sign;" weighs 28 lb.; in service, 45½ in. high x 22 in. wide; collapsed, 50 x 22 x 1¼ in. **Industrial Products Co.**, Philadelphia, Pa.

Construction departments of utilities may find useful a new "caution—men working" sign in which the sign frame is suspended by a free pivot on each side so that it can move with the wind within certain limits. With this construction, the sign standard can relieve the wind pressure and so be protected from blowing over. Supporting legs are designed so that one fits within the other when the standard is collapsed, to take up a minimum of space for storing.

Lightning Arresters

Better protection against long, heavy lightning surges is claimed for this improved form of LV lightning arrester for distribution systems. Change in the blocks or valves is said to provide an increase in surge-current capacity; new insulating coating for sides of blocks reduces external flashover; special terminal plate improves



LV lighting arrester; for distribution circuits where maximum line-to-ground voltages are 3,000, 6,000 or 9,000 volts. **Westinghouse Electric & Mfg. Co.**, East Pittsburgh, Pa.

uniformity of performance; improvements in quench and porcelain gaps increase range of power-follow currents that will be interrupted.

Metal Spray Gun

"Speedmaster" metal spray gun; capacities range from 8 lb. per hr. for aluminum to 80 lb. per hr. for lead. **The Master Metal Spray Co.**, 2527 Magnolia St., Oakland, Calif.

Rebuilding and reconditioning of crank shafts, piston and pump rods and other types of circular machine elements through the deposition of a metal is accomplished with this metal spray gun. It uses various metals, including bronze, copper and aluminum, in wire or rod form. Throttle control permits variation in speed.

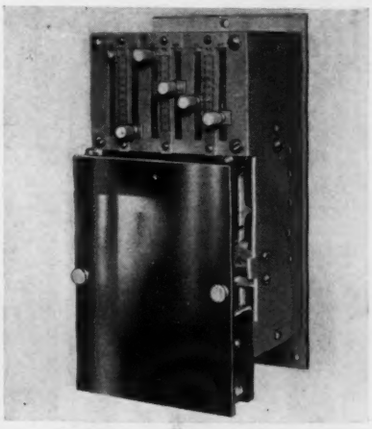
Welding Control

"Sterling G-R remote control system"; for company's transformer-type arc welders, ranging from a 20- to 125-amp. unit to heavy-duty units with maximum output of 1,250 amp. **Sterling Products Co.**, Los Angeles, Calif.

Welding current may be regulated without interrupting the work or breaking the arc through the use of this remote control system, it is claimed. Control operates through a switch mounted on the welding tongs which actuates a low-voltage relay circuit controlling a reversible motor which in turn operates the "stepless" heat control on the welding machine. Thus the operator is given constant, "finger-tip" control of the welding heat.

Reset Timing Relay

Synchronous motor driven reset timers are announced for incorporation in manufacturing or process control systems involving a time element, for applications requiring one or more contact operations in a timed sequence. One such application might be for use in starting several large motors in a pretimed sequence to prevent the starting currents of all motors coming on the line together. Timer consists of a moving plate driven by a synchronous timing motor through a solenoid-operated clutch. Contacts are opened and closed with a make and break action as the plate is driven downward. When the clutch is disengaged, the plate is reset by a spring.



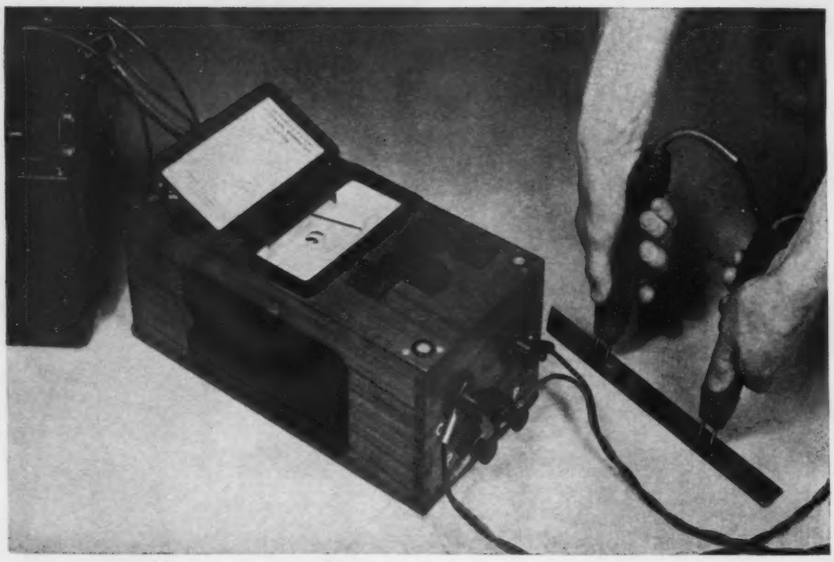
"Multiflex" instantaneous reset timer; contacts rated at 10 amp., 110 volts; timers offered for standard voltages and frequencies up to 550 volts a.c. **Eagle Signal Corp.**, Moline, Ill.

HE WOULD HAVE BEEN AS INVULNERABLE AS HUBBARD DOUBLE-DIPPED HOT GALVANIZED POLE LINE HARDWARE—GUARANTEED COMPLETELY COVERED WITH SMOOTH, HEAVY NON-POROUS ZINC COATING.

HUBBARD AND COMPANY

PITTSBURGH . . . OAKLAND CALIFORNIA . . . CHICAGO

"HANG THE LOAD ON HUBBARD HARDWARE"



"DUCTER" LOW RESISTANCE TESTING SET

Direct Reading Down to .000001 ohm

Without any adjustments or "balancing" this portable instrument gives *direct* pointer indications of resistance down to one *millionth of an ohm!* Simple, rapid, accurate and reliable for measuring armature, field and transformer coils, soldered joints, fuses, switch and relay contacts, and other low resistances. Saves time, trouble and calculations. A unique member of our famous "Megger" family of resistance-measuring instruments.

Write for descriptive Bulletin 1440-W.

James G. Biddle Co.

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"THERE!.. THAT'LL KEEP YOU OUT OF TROUBLE!"

The dependability of this long-lasting friction tape is *built in.* It is made of only top quality fabric and adhesives, scientifically treated to retain pliability and to resist the elements. It handles quickly and easily...adheres firmly. A first-class tape for a first-class job.

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OFFICES IN 83 PRINCIPAL CITIES. EXECUTIVE OFFICES: GRAYBAR BLDG., NEW YORK

Aerial Ladder

Twenty fixed positions of operation through 360 degrees in the horizontal plane by means of a lever controlled at either hand wheel at the base are available with

"American" revolving aerial ladder servicing street light; 21 ft. 6 in. maximum height. **The American Coach & Body Co.**, Cleveland, Ohio.

this revolving aerial ladder, the company states. Other features include: One-man operation; ladder extends over parked cars—extends 15 ft. 3 in. from side of truck; curved platform automatically adjusted to "positive" level at all times. Ladder can be raised from a position 30 degrees above horizontal to 15 degrees off vertical in less than half a minute, it is claimed.

•

Industrial Howlers

Industrial howlers. **Benjamin Electric Mfg. Co.**, Des Plaines, Ill.

Increased sound volume, greater audibility and separable construction are stated features of this improved line of howlers for industrial signal use. A turn of a threaded ring detaches the howler from its base and the entire assembly plugs into a base socket in much the same way an appliance is plugged into a wall outlet.

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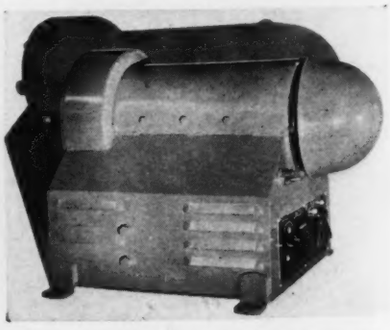
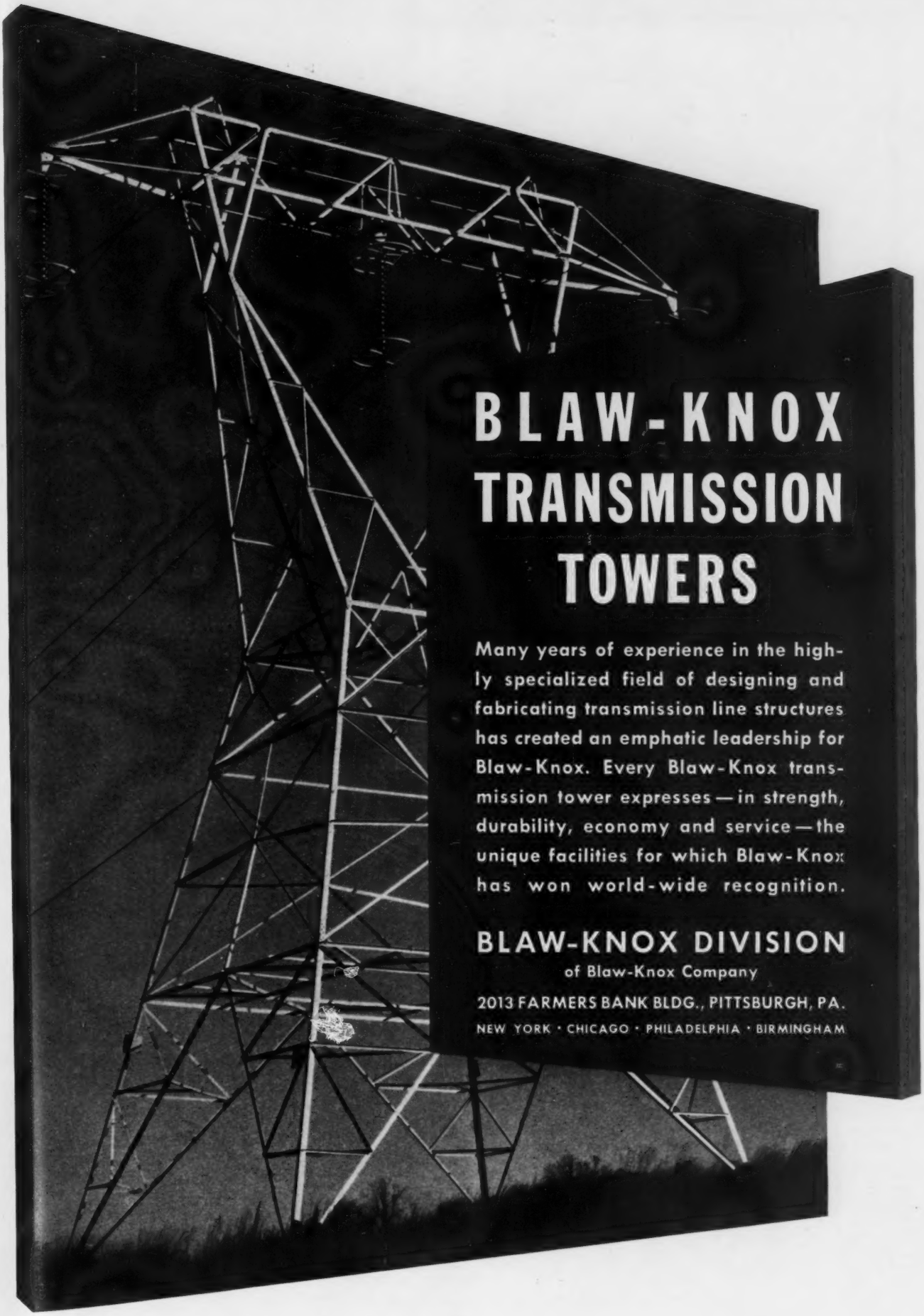
Arc Welder

Designed chiefly for small shop use, this arc welder has been built for use with electric motor drive. It uses the company's "dual continuous" control, which permits



"Shield-Arc Junior" welder; rated at 200 amp., current range for welding duty, 30-volt arc, is 60 to 250 amp. **The Lincoln Electric Co.**, Cleveland, Ohio.


BLAW-KNOX
TRANSMISSION
TOWERS
Many years of experience in the highly specialized field of designing and fabricating transmission line structures has created an emphatic leadership for Blaw-Knox. Every Blaw-Knox transmission tower expresses — in strength, durability, economy and service — the unique facilities for which Blaw-Knox has won world-wide recognition.
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Hot Rolled Copper Rods • Bare and Tinned Strand
Bare and Tinned Copper Wire
(In Rounds, Flats and Squares)
URC Weatherproof Wire
Cotton, Paper and Asbestos Magnet Wire
(In Rounds, Flats and Squares)
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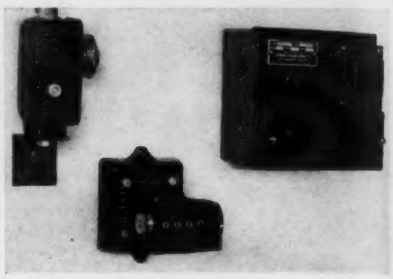
independent adjustment of voltage and current. It can be used with either bare or "shielded-arc" electrodes, for welding light-gauge metals, galvanized sheet, repairing cast-iron parts, fabricating angle iron and plate parts and structures.

•

Photo-electric Equipment

Amplifier contact relay unit, terminal board, power transformer for amplifier and light source are mounted as integral parts of the amplifier unit cover in this assembly of photo-electric counting equipment. Sensitivity control is provided to permit operation on visible or invisible light. Control relay is of the plug-in type; contacts on relays are normally closed, but open when light is interrupted, closing an additional pair of contacts.

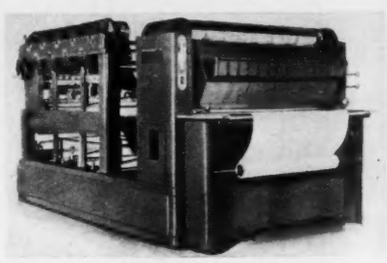


"Model 566" photo-electric counting equipment and general-purpose contact relay "Type 566"; counting speeds to 600 per min., contacts rated for 3 amp. at 110 volts a.c. **Lipman Engineering Co.,** Pittsburgh Pa.

•

Blue Printing Machine

This continuous blue printing, washing and drying machine uses actinic arc lamps which are controlled through a switch arrangement that permits the lamps to operate at any one of three speeds. Washer comprises three horizontal tanks on which the paper floats as it is washed, the idea being to eliminate tension wrinkles and distortion. Nine aluminum drums are used to dry the paper evenly. Potash and hypo application is interchanged by lever control.



"Model 22" continuous blue printing, washing and drying machine; 24 linear ft. per min. on d.c. or 18 linear ft. per min. on a.c. available for large tracings. **The C. F. Pease Co.,** Chicago, Ill.

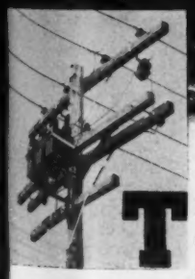
•

Flashing Beacon Controller

"Novalux" traffic-beacon flasher. **General Electric Co.,** Schenectady, N. Y.

A suppressor unit to prevent radio interference is incorporated in this flashing beacon controller. Sheet-steel housing is gasketed against atmospheric conditions and silver contacts are said to handle up to 10 amp.—60-watt traffic-signal lamp takes only 0.55 amp.

there is no substitute for experience



THE rules of sailing can be learned from a book. With this knowledge, even a landlubber can venture out into open water and, given a gentle breeze, make a decent show of it. But when a spanking Sou'wester sends the whitecaps crashing over slippery decks, handling a boat takes something more. It takes experience.

So it is with the manufacture of capacitors. The principles — the materials — these are common knowledge. But building in long life—flashing performance—the kind of dependibility that makes your capacitor installation a paying investment — that takes experience.

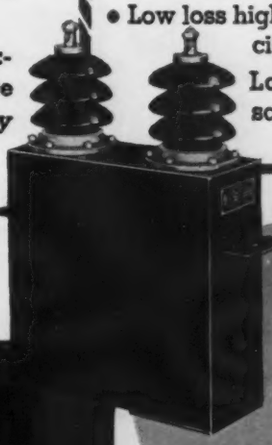
For more than twenty-nine years Cornell-Dubilier has specialized in the manufacture of capacitors exclusively. This experience accounts for the superior performance record of C-D's, . . . *and for the fact that there are more C-D's in use today than any other make.* There is no substitute for experience.*

Investigate how Cornell-Dubilier can put twenty-nine years of capacitor specialization economically to work for you. Complete details on request. Cornell-Dubilier Electric Corporation, South Plainfield, New Jersey. Canadian representative: English Electric Company of Canada, Ltd., St. Catherine, Ontario.

LOOK

at these **C-D** features

- Impregnated and filled with non-inflammable, non-explosive Dykanol.
- Heavy-duty, three petticoat, fog-type bushings.
- Durable arc welded, leak-proof, copper bearing steel case protected by double coat of weatherproof paint.
- Large number of small capacitor windings, each impressed with a low potential.
- Low loss high quality capacitor tissue used.
- Large factor of safety in design.



There are more

CORNELL-DUBILIER CAPACITORS

*in use today than any other make**

* Including all applications.

CD

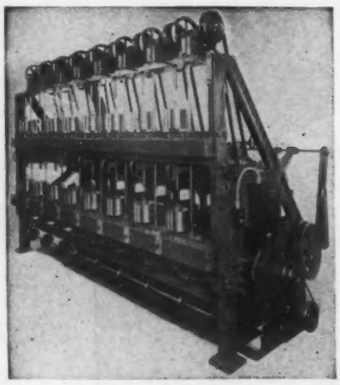
CORNELL-DUBILIER

BURNDY ENGINEERING CO., Inc.

ELECTRITE
A high grade fibre board for electrical insulation. A material of quality possessing high tensile and dielectric strength. Used by many of the leading manufacturers of electrical equipment.

DENSITE
An extremely hard board of superior quality which can replace the more expensive types of insulating materials.

Pulp Products Department
WEST VIRGINIA PULP & PAPER COMPANY
230 Park Avenue, New York, N.Y. 35 E. Wacker Drive, Chicago, Ill.



AIMCO 2D8-MBB Machine
for applying
FIBERGLAS, CELLOPHANE
COTTON and PAPER
Each Unit Individually
Motor Driven
New England Sales Representative:
SIDNEY B. BLAISDELL
228-232 Aborn St., Providence, R. I.
EST. 1855 AIMCO INC. 1928
"American" INSULATING MACHINERY COMPANY
519 West Huntingdon St.
PHILADELPHIA, PENNSYLVANIA, U.S.A.

TECHNICAL BULLETINS

POWER CABLE—Anaconda Wire & Cable Co., 25 Broadway, New York, N. Y., has available a new catalog covering rubber-insulated power cables. Physical and electrical characteristics are given for all types and a complete section on coding details of control cables is inluded, as well as new tables on current-carrying capacity.

BUILDING WIRE—"NEMA Report on Investigation of Small Diameter Building Wire" has been released by the National Electrical Manufacturers Association, 155 East 44th St., New York, N. Y. It concerns itself primarily with the investigation to find out more about the permissible current-carrying capacity of the new small wire with a "heat resistant" insulation under various installation conditions.

INSULATING MATERIALS—Included in the 1938 edition of the American Society for Testing Materials' Standards on Electrical Insulating Materials are all 40 of the specifications and test methods this society has issued. Statements are included on the significance of the various tests made on these materials. Copies are available at $2.00 each from the Society headquarters, 260 South Broad St., Philadelphia, Pa.

BOILERS AND AUXILIARIES—Statements by operating companies and manufacturers on operating and design problems relating to boilers, superheaters, economizers, air heaters and their auxiliaries are contained in Publication No. F15 of the Edison Electric Institute. Boiler outage data for 1937 are tabulated and analyzed and a compilation of the practices of operating companies in the welding of piping for high-temperature, high-pressure service is included. Copies may be obtained from the E.E.I. headquarters, 420 Lexington Ave., New York, N. Y.; they are priced at $2.50 to non-members in the U. S.

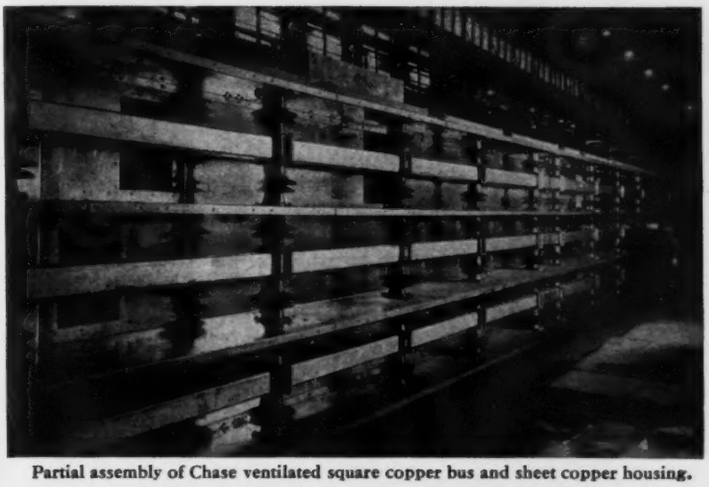
STATIC IN BLOWER SYSTEMS—Underwriters' Laboratories, Inc., 161 Sixth Ave., New York, N. Y., discusses "Generation of Static Electricity in Blower Systems" in research bulletin No. 8. Plan of investigation, test record, including description of test equipment and conclusions of test are discussed.

NICKEL IN THE BRASS FOUNDRY—An index to a series of bulletins based on work with nickel in the brass foundry and describing properties, applications and production of these metals and the nickel silvers has been prepared by the International Nickel Company, 67 Wall St., New York, N. Y.

ELECTRICITY AND WHEELS—A booklet with this title is one of a series prepared by the Department of Public Relations, General Motors Corporation, Detroit, Mich., which treat informally of technical subjects relating to transportation. The progress of electricity from the discovery of the magnet to the present time is discussed and the part played by electricity and electrical devices in the modern automobile is reviewed.

GALVANIZED COATINGS—Bulletin 675-G of the Ohio Brass Company, Mansfield, Ohio, is an eight-page reprint of an article in *Iron Age* giving the results of an investigation to determine satisfactory methods for measuring the weight and uniformity of hot-dip galvanized castings and forgings.

Mighty Boulder Dam cuts material costs, saves space with CHASE



Partial assembly of Chase ventilated square copper bus and sheet copper housing.

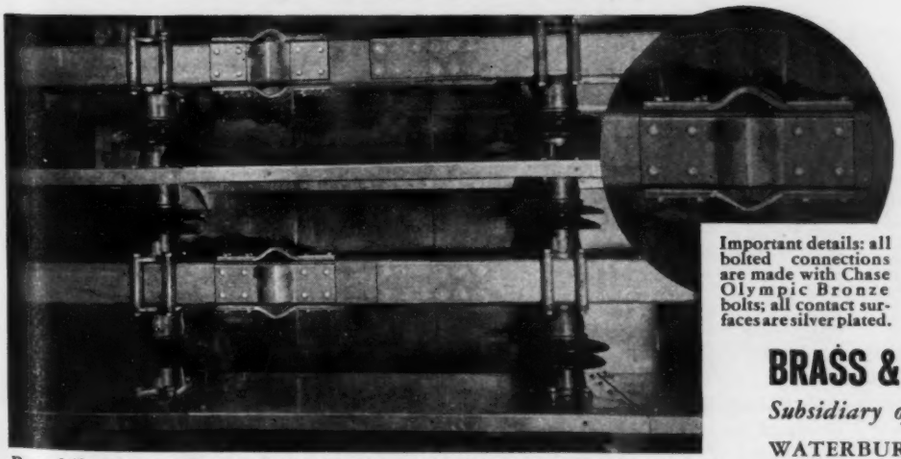
Section of assembled bus with Chase Copper compartment doors in place.

SQUARE COPPER TUBE BUSES

Boulder Dam uses Chase heavy duty one-piece bus bars for its generator buses. These 6" ventilated square tubes, in Chase Copper housings, carry 3,000 amperes and are designed to withstand short circuit stresses of 1900 pounds per foot.

Chase square copper tube carries the load—yet gives a material saving over laminated bus construction, both in amount of copper and in number of fittings required. With equally great rigidity both vertically and transversely, spans can be much longer between supports. Result: a neater, more economical installation.

No matter how large or how small the installation—let Chase engineers work with you in finding the type and size of bus that best meets your requirements. Their help is yours for the asking. Just write.



Important details: all bolted connections are made with Chase Olympic Bronze bolts; all contact surfaces are silver plated.

Part of Chase Copper Bus showing laminated expansion joints and removable sections.

CHASE

BRASS & COPPER CO., *incorporated*
Subsidiary of Kennecott Copper Corporation
WATERBURY CONNECTICUT

Designers and Manufacturers of Brass and Copper Products for the Electrical Industry

NEWS ABOUT PEOPLE

Neblett Named Assistant Head of Turbine Division

R. S. Neblett has been appointed assistant manager of the turbine division of the General Electric Co. Mr. Neblett has been connected with the

turbine division of the company since 1926 and has been manager of sales of the Schenectady section since 1938.

He has been with the company continuously since 1923, when he entered the test department immediately following his graduation from Georgia Tech in that year with the degree of bachelor of science in electrical engineering.

▪

▶ J. H. VOGEL has been appointed to the position of general works manager of the York Ice Machinery Corp., York, Pa. Mr. Vogel entered the employ of York in 1915. He has been assistant works manager in charge of methods and equipment since 1934.

▶ THREE NEW APPOINTMENTS have been made in the Southwest district of the General Electric Co., Dallas, Tex., according to L. T. Blaisdell, commercial vice-president there. R. T. SHIELS, manager of the industrial department, has been selected as assistant to the district manager. H. A. WHITE, manager of the El Paso office, succeeds Mr. Shiels and E. C. WISE, of the general sales department at El Paso, succeeds Mr. White.

▶ LOUIS RAMP, for fifteen years connected in various capacities with the municipal power plant at Rensselaer, Ind., has been appointed by Mayor Conrad Kellner as successor to the late Charles S. Chamberlain as a general plant superintendent.

▶ WATT L. MORELAND was elected president of the Los Angeles Board of Water and Power Commissioners at the recent annual organization meeting. FRANKLIN D. HOWELL was elected vice-president.

▶ M. G. O'HARRA, vice-president in charge of sales of all household appliances of the Norge division of the Borg-Warner Corp., will direct the entire sales activities of the division under a new merchandising program recently announced. Executive merchandising authority is being concentrated, it was explained, to meet improving business conditions. JAMES A. STERLING, who becomes general merchandise manager, will assist Mr. O'Harra. Mr. Sterling will direct merchandising plans for all Norge products, including sales, advertising and sales promotion.

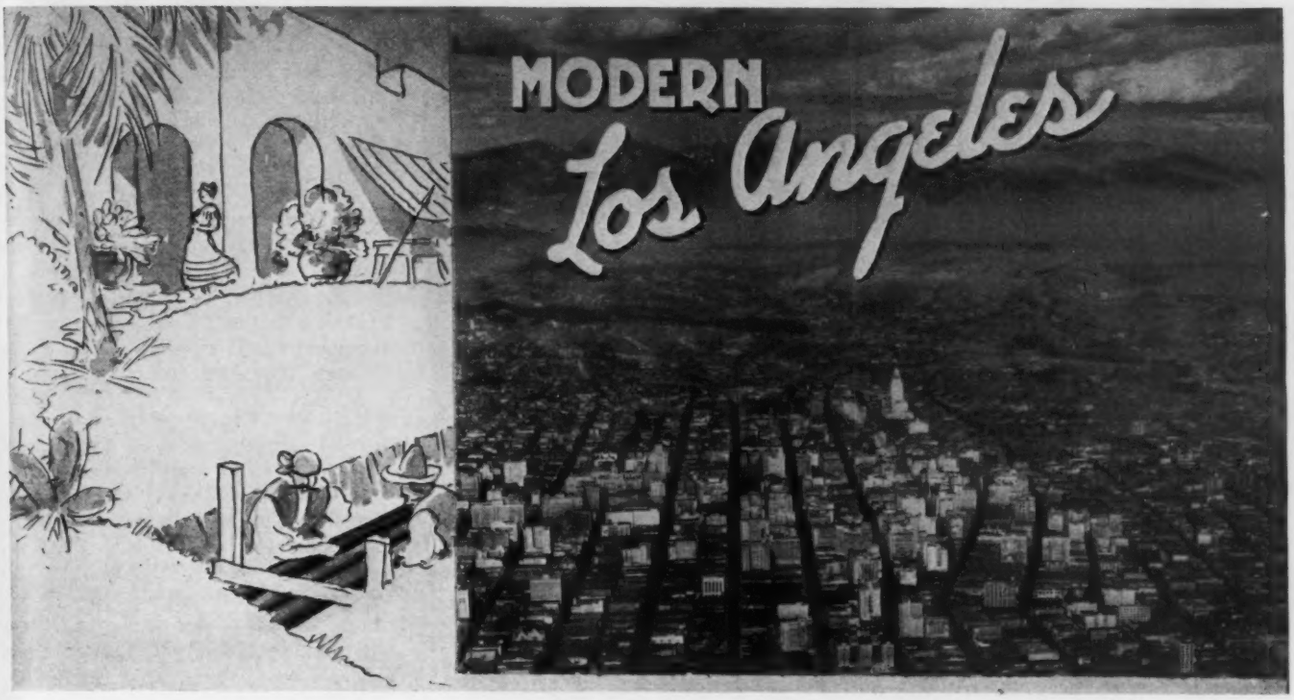
▶ JAMES B. BLACK, president of Pacific Gas & Electric Co., was elected a director and member of the executive committee of Southern Pacific Railway, coincident with moving the road's executive offices from New York to San Francisco.

▶ I. A. YOST has been appointed manager of engineering of the lighting division of the Westinghouse Electric & Manufacturing Co., Edgewater Park, Cleveland, Ohio. Mr. Yost has been with Westinghouse since 1924.

▶ WALTER R. MCDONALD has been re-elected for a second term of two years as chairman of the Georgia Public Serv-

ANNIVERSARIES CELEBRATED—Two engineers of Hartford Electric Light Co., well known in the utility industry, round out many years of service amid company acclamation. (Right) Wilbert D. Gorman, 30-year man, and illuminating engineer par excellence, pauses to think it over; (left) Edward Y. Rice, quarter-century employee, and highly qualified superintendent of the lighting department, ponders over felicitations received.

ORANGEBURG HAS *long* BEEN PART OF



© Fairchild Aerial Surveys, Inc.

In two decades, the population of Los Angeles has tripled; its city area has expanded to more than twice that of Greater New York; and electrical distribution has kept pace! Underground distribution has also met the ever-increasing demands of modern industries,—the air conditioning, the heating and the lighting for which this community is famous.

NOCRETE FOR "SERVICES"

Installed underground without concrete encasement, NOCRETE

— *costs less*
— *installs cheaper*

All types of fittings, adaptors, bends, etc. are available at substantial savings.

It provides the best of underground services where service counts and usually costs the most.

Check into this ORANGEBURG point that counts.

The Orangeburg trademark is a guarantee of the best of Fibre Conduits, a time-tested, enduring "service" of cable protection *wherever electrical raceway facilities are to be installed underground.*

● The first underground services in this wonder city were made with ORANGEBURG Fibre Conduit decades ago.

Today, Orangeburg NOCRETE Conduit, laid without concrete encasement, is approved and recommended practice for underground house connections from the utility duct bank to inside service.

Orangeburg NOCRETE costs permit a larger size "service" (for future increased requirements) at a lower cost,— or, the same size raceway at the lowest cost.

Characteristic of all ORANGEBURG Fibre Conduit, NOCRETE is easy to handle, cut and fit around obstructions — thus making for real savings in installation costs.

For installation underground *with* CONCRETE ENCASEMENT: ORANGEBURG STANDARD Fibre Conduit is recommended for duct banks (4 ducts and over), main distribution, high tension and "downtown" locations.

For installation WITHOUT CONCRETE ENCASEMENT: the ORANGEBURG dual-economy NOCRETE Conduit is recommended for service entrances, extensions, parkway and street lighting, suburban distribution, laterals, signal systems, etc.

Sales Agent—Distributors

GENERAL ELECTRIC SUPPLY CORP.

GRAYBAR ELECTRIC COMPANY INC.

**MADE AT ORANGEBURG, NEW YORK
BY THE FIBRE CONDUIT COMPANY
292 MADISON AVE. NEW YORK CITY**

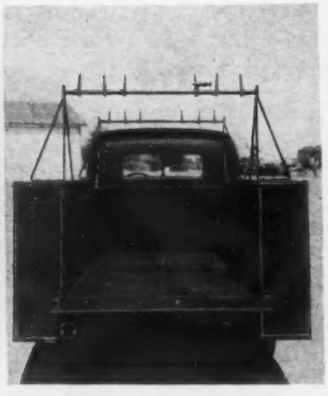
ORANGEBURG *Standard* for installation *with* concrete encasement
NOCRETE for installation *without* concrete encasement

HIGHWAY BODY FOR

All Purpose DUTY

This body was developed to give utilities and telephone companies a general service body to take care of all odd jobs. It is really a "handy man"—lightweight, durable, and efficiently designed to utilize every unit of space for the whole assortment of tools and materials used in service work. Accessibility is a feature.

Investigate the possibilities this new body offers you—see how modern design has given you an all purpose body that will save money for you. Write for descriptive catalog giving details on this body and other Highway bodies for every need.



RUSTPROOF, GALVANEALED METAL

This body can be used for minor maintenance, meter installation, gas maintenance, to handle delivery of refrigerators, and for other service jobs. The bodies are made of rust-resisting metal and will stand up under long and varied service. Modern in every detail.

HIGHWAY TRAILER CO.
EDGERTON WISCONSIN

ice Commission. Commissioner PERRY T. KNIGHT was elected vice-chairman, succeeding Commissioner MATT L. MCWHORTER, who has occupied that position since his election to the commission in 1936. Mr. McWhorter was elected to head the motor carrier division of the commission.

▶ RALPH RAYMOND, supervisor of sales promotion, lighting sales department, Commonwealth Edison Co., has recently been appointed supervisor of home service and sales promotion of the lighting sales department. Previous to December, 1938, when he became connected with the Edison company, Mr. Raymond was managing director of the Chicago Lighting Institute.

▶ G. R. PROUT has been appointed manager of sales of industrial control, and W. T. Darcy has been appointed manager of sales of renewal parts, according to a recent announcement by W. C. Yates, manager of the control and renewal parts division of General Electric's industrial department. Mr. Prout has been identified with General Electric since 1923 and Mr. Darcy since 1925.

▶ C. H. GUY, for the past three years merchandising manager of the Westinghouse Electric & Manufacturing Co. in the south central district with headquarters in Birmingham, has been transferred to Chicago, Ill., to succeed C. A. Dostal as merchandising manager of the northwestern district, according to an announcement by F. R. Kohnstamm, Westinghouse merchandise division sales manager. Mr. Dostal was recently appointed manager of sales for the Pacific Coast district. Mr. Kohnstamm also announced that the southeastern and south central districts of the company will be consolidated under the management of S. M. Davison, with headquarters in Atlanta, Ga.

OBITUARY

▶ KIRKE P. SANBORN, 69, chief engineer of the Reading (Mass.) Electric Light Department and a member of its staff for the past 33 years, died in that town on August 8.

▶ BAYARD R. FRAZIER, 59, who retired fifteen years ago from the engineering department of the Pittsfield (Mass.) Works of the General Electric Co., died at Dalton, Mass., on August 9.

▶ HUGH M. BRANTLEY, illuminating engineer and for many years associated with the commercial department of the Union Electric Co., St. Louis, Mo., died in St. Mary's Hospital in that city on August 9, as the result of an operation. Mr. Brantley had been associated with the Union Electric Co. since 1906.

MANUFACTURING - MARKETS

TVA Lets Contracts Valued at $421,988

Tennessee Valley Authority has announced the award of eighteen contracts for equipment and materials valued at $421,988.

Two electrical manufacturers were awarded contracts for material for the Hiwassee Dam: General Electric Co., main control switchboard for the power plant, $21,140, and Southern States Equipment Corp., 161-kv. outdoor disconnecting switches, $9,080.

Habirshaw cable and wire division of Phelps Dodge Copper Products Corp. will supply equipment for the Chickamauga Dam in the form of rubber-insulated wire and cable for power control, lighting and heating circuits, $31,932, and paper-insulated, lead-covered cable and accessories for generator and transformer leads, $28,159.

Other contracts included:

Victor Insulators, Inc., suspension insulator units, $34,800; Aluminum Co. of America, conductor cable for TVA's Albertsville-Fort Payne-Scottsboro line in Alabama, $32,436; Allis-Chalmers Manufacturing Co., voltage regulator for Dickson, Tenn., substation, $18,990; General Electric Co., voltage regulator for the Clarksville, Tenn., substation, $10,517.

For the authority's chemical engineering department at Muscle Shoals, the Kuhlman Electric Co. will supply electrical equipment valued at $16,535.

•

Equipment Ordered for Shasta Plant

Additional hydro-electric equipment for the power plant at Shasta Dam, Central Valley Project, California, was ordered recently by Secretary of the Interior Harold L. Ickes.

A contract for furnishing two generators for station-service units was awarded to the General Electric Co., Schenectady, N. Y., on the company's bid of $52,500. The station-service units will furnish electricity for operation of gates, valves, hoists, elevators, cranes and other machinery, and will also furnish electricity for lighting of Shasta Dam.

In addition to one of these 2,500 kva. generators, each station-service unit will consist of a 3,500-hp. turbine and a governor for regulating the speed of 600 r.p.m. The contractor will deliver these two service-station generators within 700 days after notice has been received of the award of contract.

•

Electric Truck Shipments

Domestic shipments of electric industrial trucks and tractors during July numbered 61, as against 71 in June and 40 in July last year, according to the Department of Commerce.

VIVIEN KELLEMS, president of Kellems Products, Inc., about to board the Pan-American Clipper for Europe to assist the International Standard Electric Corp. in perfecting the manufacture and selling plans for her company's new strain relief and rubber plug

Kearney Earnings Up 75 per Cent in 1939

Estimated earnings of the James R. Kearney Corp. for the first seven months of 1939 after charges were equal to 63 cents per common share, an increase of 75 per cent over the 36 cents in the first seven months of last year. Volume of sales was 14 per cent above the seven months of last year. The seven months' earnings covered the full year dividend requirements on the preferred stock ten times.

The corporation has declared an extra dividend of 12½ cents per share on the common in addition to the regular dividends of 12½ cents, both payable October 1 to holders of record September 15.

•

Aluminum Co. Exempted

Securities and Exchange Commission has exempted the Aluminum Co. of America and several subsidiaries from requirements of registration under the Holding Company Act on the ground that the subsidiaries were not public utilities. The SEC found that the subsidiary companies furnished most of their output to the Aluminum company and very little to other users. Therefore, it said, the companies were not to be considered public utilities within the meaning of the act.

•

Caterpillar Tractor to Redeem Preferred

Directors of Caterpillar Tractor Co. have adopted a resolution that provides for retirement of all the 5 per cent $100 par value preferred stock on November 25 at par and accrued dividends. Directors did not disclose any arrangement for financing, which will require approximately $12,000,000.

A dividend of $1.25 a share was declared on the preferred and 50 cents

a share on the common, both payable August 25 to stock of record of August 15.

Net profit for June was $479,438 against loss of $444,514 in the same month last year. Net profit for the first six months was $2,315,380, against $1,132,614.

•

Manufacturers Make Sales Assignments

Electrical manufacturing companies have recently announced the following appointments:

Schweitzer & Conrad, Inc., has named Robert H. Anthony, Boston, Mass., as New England correspondent to succeed the late H. E. Stockwell. Mr. Anthony is well known in the central station industry in New England, having operated as a manufacturer's agent in Boston for many years. He also represents the G. & W. Electric Specialty Co. and the Electroline Co. of Chicago.

Lapp Insulator Co., Inc., Le Roy, N. Y., has appointed the T. R. Routh Co., San Francisco, Calif., as representative for the San Francisco and northern California territory. Mr. Routh has had many years experience in engineering selling.

Edmund B. Barnes, for the past three years a member of the Kelvinator advertising staff, has been promoted to an important district sales managership, according to an announcement by Frank R. Pierce, general sales manager of the Kelvinator division of Nash-Kelvinator Corp. Mr. Barnes will serve as district sales manager in the area embracing such large cities as Cleveland, Pittsburgh, Cincinnati, Columbus and Louisville, which is a part of the company's East-Central region, managed by Marvin S. Bandoli. Mr. Barnes will make Detroit his headquarters city.

W. A. Hesse & Co. has announced the appointment of the firm Le Progres Technique, Paris, France, as European representative to distribute its products.

•

Carrier Awarded Contract

Carrier Corp. has been awarded a contract for seven centrifugal refrigerating machines to supply cooling for the new Social Security Building under construction in Washington. Vice-President E. T. Murphy said that this installation "was the largest single refrigeration installation to be made at one time for a single building in the history of the air conditioning business."

New York Metal Prices

	Aug. 22, '39 Cents per Pound	Aug. 16, '39 Cents per Pound
Copper electrolytic	10.50*	10.50*
Lead Am. S. & R. price	5.05	5.05
Antimony	12.00	12.00
Nickel Ingot	35.00	35.00
Zinc, Spot	5.14	5.14
Tin, Straits	48.70	48.75
Aluminum, 99 per cent.	20.00	20.00

* Delivered Connecticut Valley.

Field Reports on Business

The European war scare this week has given business leaders another case of jitters, with security markets under pressure and some disturbance in other lines. For the most part business appears to be headed for greater volume. Prospects of more utility construction seem certain.

NEW YORK

The continued unrest in Europe is having an adverse effect on business in this area, which is always susceptible to war scares. Many are expressing the opinion that the condition of keeping inventories down to low levels will prevail for some time, even in the face of rising demand for goods. Trade in this area was slightly higher, with pronounced gains in industrial lines centered on producers' and heavy consumers' goods. Retail trade was more than seasonal and inclined to irregularity in some lines.

Engineering awards last week were 37 per cent above a year ago, although showing a recession from the previous week. Awards so far this year are 16 per cent above the 1938 volume. A bright spot in the picture is the attitude of the utilities to go ahead with construction projects. Commonwealth & Southern is to increase expenditures $16,000,000 following sale of its Tennessee properties to TVA and municipalities. Alabama Power is to start construction of a $4,000,000 steam plant in Mobile.

The fine reception which utility issues have had in the capital markets indicates that more companies will soon be giving attention to refunding and new issues. Utility issues are gaining in investor demands.

Sharp demands for summer air-conditioning and room-cooling equipment has led manufacturers to continue their drive, with emphasis in the fall on winter air conditioning. Continued hot and humid weather in this area has been an aid in sales of electric fans, refrigerators and air units. Utilities are pushing their drives on appliances.

CHICAGO

In spite of the clouds of uncertainty hovering over the foreign and domestic political situation, a feeling of optimism prevails regarding the business outlook during the fall and winter. Throughout the Middle West the trend continues upward over a broad front. The pick-up in demand for heavy equipment coupled with the rapidly increasing production schedule for automobile output is most encouraging.

In addition, further gains are appearing in railroad purchases for new equipment and maintenance work. Activity in the steel mills is expanding as a result of orders received over a wide range of sources. Retail trade continues to advance moderately, while the large mail order houses report record-breaking sales volume for the past month and for the year so far.

Electrical power output declined slightly last week to a point 6 per cent above a year ago. Electric room cooler sales increased sharply during July, totaling 312, as compared with 96 in the same month last year. Central-plant air-conditioning systems installed during the first seven months of the year were 258 with 3,773 hp. capacity, as compared with 262 with 3,499 hp. capacity in the same period last year.

Commonwealth Edison Co. awarded contracts last week for 760 transmission towers to be used in the 130-mile line running to Crawford, Ill. This is part of the Powerton station expansion program on which $3,400,000 will be spent this year and $7,300,000 in 1940.

PACIFIC COAST

Staple lines are moving fairly well, though in coil and carton units of purchase, and prices are more stable. Labor conditions are appreciably better than last year, and, in general, the Pacific Coast moves into what is hoped to be a good fall season with most basic factors in satisfactory shape, the one element lacking being confidence in Administration support.

Lighting business continues excellent, with many medium-size street lighting jobs, particularly in Bay area; floodlighting equipment for flying fields at Hawthorne, Nev., and Riverside, Calif.; street lighting and distribution systems for Lowrey Field, Colo., and McChord Field, Wash.; $10,000 orders for standards for Stockton and Oakland; a $45,250 Los Angeles street lighting award, and $6,000 sodium lights for San Francisco, with several planned bridge approaches providing good prospective orders.

Continuance of large scale electrical installations as a nucleus for staple business seems assured by new War Department allotments, including $9,500,000 in Hawaiian Islands, $3,600,000 for Alaska, $1,500,000 each for California and Washington and an expected $3,500,000 for Ogden. Machinery orders are temporarily slower, a 2,300-kva. turbine generator for Yakima, Wash., Indian Reservation and $23,000 transformers for Imperial Valley irrigation system being outstanding.

NEW ENGLAND

Central Maine Power Co. has ordered a 26,667-kva. G. E. generator, a 34,000-hp. Allis-Chalmers vertical waterwheel and three 8,889-kva. Westinghouse oil-insulated, forced cooling transformers for the Wyman station at Bingham. Circuit breakers and lightning arresters for this station have also been bought from Westinghouse. During the past week two 1,000-kva. transformers were purchased for a Massachusetts substation and three 333-kva. units for a Vermont station. Distribution transformer sales in the Connecticut area are active and inquiries are being received in good volume by manufacturers.

Small motor sales are active due to continued activity among both textile plants and machine manufacturing industries. Riley Stoker Corp., Worcester, was low bidder on a $446,371 boiler equipment and accessory contract for the U. S. Navy. The Marblehead, Mass., municipal light plant has completed a generating plant modernization program costing approximately $130,000, and among other heavy machinery purchases reported recently is noted an order placed by Maine Central Railroad for two 600-hp. Diesel-electric switching engines.

Contracts for large amounts of wiring for power and light in U.S.H.A. projects in the Boston area are now being studied. Fifteen low-pressure, oil-fired steam boilers using 2-hp. motors for rotators will be used on the Charlestown project and fourteen similar types for the Mission Hill project.

Recent Rate Changes

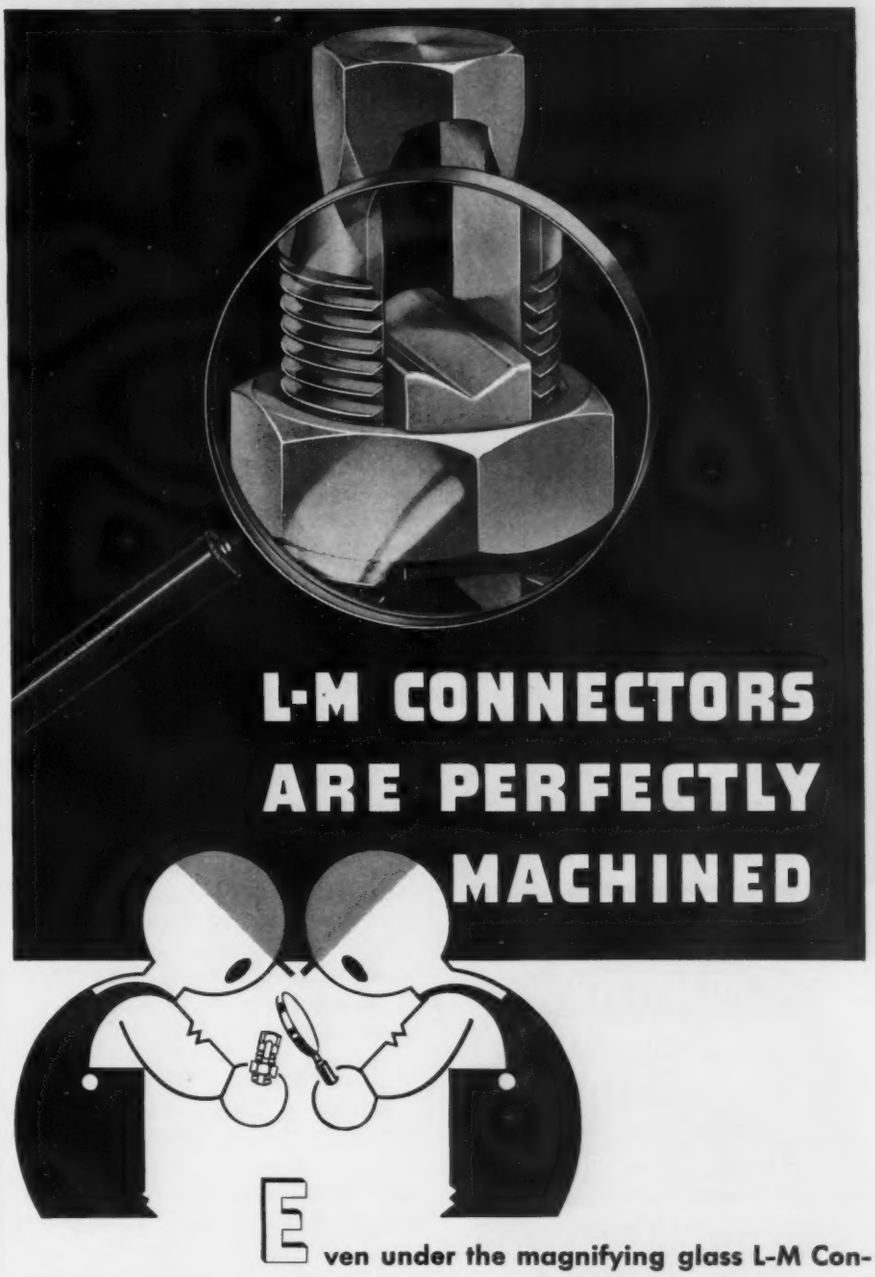
NEW YORK POWER & LIGHT CORP. will make an annual reduction of $1,000,000 in its rates for electricity, Chairman Maltbie of the state Public Service Commission has announced. He said negotiations with Alfred H. Schoellkopf and Floyd L. Carlisle regarding a substantial reduction of rates has been completed, to become effective as soon as revised schedules could be prepared. The commission requested that rates be reduced $1,000,000 a year and this was agreed to, Mr. Maltbie stated. The new rates will affect consumers in sixteen eastern and northern New York counties.

KANSAS CITY POWER & LIGHT CO. has been ordered by the Missouri Public Service Commission to cut its electric rates $161,833 a year, effective October 1. The commission fixed the rate the company will be allowed to earn on its valuation at 6½ per cent and the valuation at $71,000,000. In fixing 6½ per cent as a fair rate of return the commission deviated from the long standing practice of allowing utilities to earn between 7 and 8 per cent. The lower percentage, the commission pointed out, is in line with general practice in many states. In its report the commission stated its reductions in rates affecting customers of the Kansas City company had totaled $2,002,888 since November 1, 1938. Fourteen rate reductions have been ordered since that time, the commission's report sets out.

ROCHESTER GAS & ELECTRIC CORP. has filed a revision of electric rates schedules with the New York Public Service Commission which add a "controlled off-peak" provision to the residential rates, refiles the general rates for the purpose of clarification and extends the expiration date of a large use light and power rate. No increases are effected by the off-peak provision to the general rate and the amount of reduction brought about by this change is unknown at present but will be reported later. The addition of a stopper to the commercial rates will effect no increases and results in an annual reduction of $4,000 benefitting approximately 530 customers.

OHIO EDISON CO. has announced a new rate schedule for commercial lighting and secondary power users outside the Youngstown rate area, effective September 1, which will effect a saving for consumers of approximately $25,000 a year. The new rates are: 5 cents a kilowatt hour for the first 100 kw.-hr.; 4 cents per kilowatt-hour for the next 200 kw.-hr.; 3 cents per kilowatt-hour for the next 4,400 kw.-hr., and 2 cents for all over 5,000 kw.-hr. This compares with previous rates of 6 cents per kilowatt-hour for the first 100 kw.-hr.; 5 cents for the next 500 kw.-hr.; 4½ cents for the next 500 kw.-hr.; 4 cents per kilowatt-hour for the next 1,900 kw.-hr.; and 3 cents per kilowatt-hour for all over 3,000 kw.-hr.

VILLAGE OF BERGEN, N. Y., has filed a general revision of rates for its electric plant with the state Public Service Commission, which is estimated to reduce the bills of residential and small power users. The changes are estimated to decrease residential bills by $1,014 annually and to decrease the bills of small power users by $136 annually. Increases will result to some commercial and primary power customers which are estimated to total about $250 annually to commercial customers and approximately $481 annually to primary power users. This will be a net decrease in revenue of $419 annually.



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CENTERBROOK CONNECTICUT

Telemeter Steam, Electricity on Indianapolis System

[*Continued from page 38*]

each transmitter produces the same output in milliamperes for a given power in megawatts. Regardless of the capacities of the different flow-metering units, the totalizing can therefore be accomplished by paralleling the meter units and measuring the combined conductance by means of the Micromax recorder.

Transmission of Remote Indications

The remote indication from each Micromax instrument is obtained by placing a retransmitting slidewire on the same shaft with the measuring slide wire and thus delivering to the telephone line a small d.c. voltage proportional to the totalized flow rate. The primary source of voltage for the transmission is a primary cell of the air-depolarized type. The voltages thus produced are measured at the dispatcher's office by two type S Micromax recording potentiometers. Although this method of retransmission requires standardization of the voltage delivered by the "air cells" to the transmitting slide wires, by means of polarized relays, this operation is accomplished from the dispatcher's office, using the same telephone wires that are normally used to operate the recorder from the remote transmitter.

Protective Methods

Because of the high fault currents and resultant abnormally high ground voltage differentials that may arise between the various generating stations and the dispatcher's office, the problem of telephone line protection was carefully studied to determine the protective arrangements necessary to insure continuity of service.

All of the circuits over which these telemeters operate are lead-sheathed cable. Six hundred-volt switchboard wire is used inside the plants. The lead sheaths of the cables are isolated from the station grounds. With these facts in mind we decided to omit all grounds and carbon block arresters on the transmitting ends of the telephone line, relying only on protector tubes and instrument fuses installed at the cable terminals in the dispatcher's office. The longest and most exposed circuits are leased from the Indiana Bell Telephone Company, and should lightning or ground faults cause disturbances on these lines Western Electric KS 7677 relays and carbon block arresters will be installed at the transmitter ends of those lines and, in addition, the ground connections of the protective equipment will be carried away from the stations, to points where the ground potential is stable during faults on the power system.

Petersen Coils Protect Iowa System

[*Continued from page 40*]

grounded. The Boone and Iowa Falls areas were segregated and each coil was tuned for its respective total of transmission mileages. The system was then interconnected and the Cedar Rapids coil was tuned against the rest of the system and the two other coils in service.

During normal conditions of operation there is usually some slight unbalance in the system phase to ground voltage. This unbalance is sufficient to cause a slight amount of current to flow continuously through the coil. For tuning tests the coil ohms were varied and the current noted for each tap position. A plot of the coil current as a function of the ohms reactance of the coil was made.

The shape of the resulting curve is typical of and the same as that of a series resonant circuit with a voltage applied to it equal to the normal system unbalance. When the coil is in tune the inductive and capacitive reactance of the system balances so that the current flowing is at a maximum. If the coil is detuned the impedance of the circuit increases and the current diminishes.

Correct tuning would appear to be necessary for the correct operation of the Petersen coil, and field tests on other systems have shown that best results are obtained when the coil is adjusted to within a few per cent of exact tuning. On medium-voltage systems successful operation has been secured through a relatively wide range in coil reactance. Field tests on other systems and actual operation on the Iowa Electric Light & Power Company's system have shown that successful arc extinction is obtained with 25 to 30 per cent of the system out of service.

The Petersen coils on the Iowa Electric Light & Power Company's system were placed in operation in May, 1938, and data have been com-

piled showing comparable operating results for a period of eight months for 1937 and 1938 respectively. The accompanying table compares other systems and actual operation grounds, circuit outages and outages due to grounds for the above stated period.

It will be noted from the table that the number of grounds tabulated show a large increase in 1938 over those of 1937. In explanation, this increase is due to three conditions existing or occurring in 1938 which were not present in 1937, as follows:

1. The method used in determining the number of grounds in 1937 was by counting the number of ground currents for the period as shown by graphic ammeter charts from ammeters connected in the system grounding points. The method used in 1938 consisted of a printing device recording on a paper tape the number of times grounds occurred. This printing device records all ground currents regardless of frequency, whereas the graphic chart would not show grounds occurring in rapid succession, due to overlapping of graphic pen indications.
2. This increase may also be due to action of the Petersen coils which limited ground current to such an extent that a ground fault which would have immediately put a line out of service in 1937, extinguished and reoccurred again a number of times before a permanent fault developed.
3. It is definitely known that lightning storm frequency in 1938 was greater than in 1937.

Considering the above three contributing conditions it may be reasonably assumed that the recorded grounds in 1937 are not comparable with those recorded in 1938; *i.e.*, considerably more grounds occurred in 1937 than the number actually recorded.

In comparing outages due to grounds, the decrease from 257 in 1937 to 108 in 1938 shows that the outages in 1938 were 42 per cent of the outages in 1937. This reduction of 149 outages due to grounds over a period of eight months resulted with an indicated increase in grounds of 306 per cent. In comparing total outages, the 1938 outages were 82 per cent of 1937 outages.

These data show a definite decrease in outages in 1938 each month as compared with each month in 1937 with the exception of July, in which month in 1938 the lightning storm frequency was considerably higher than in 1937.

The large reduction in outages due to grounds is partly due to the use of high-speed relays for phase faults in 1938, which were not in service in 1937, thus clearing some faults, which may involve grounds without the use of ground relays.

Another possible reason for the decreased number of outages due to grounds is that in the five seconds between the time a ground fault occurs and the Petersen coil is shorted out (assuming the fault cannot be cleared by the coil) there is an opportunity for a phase-to-phase fault to develop and be cleared by phase relays. In general, however, the reduction in outage due to grounds is primarily due to Petersen coil protection.

Limits Damage to Lines

Due to the relatively high capacity current of the system, currents discharged from conductor to ground prior to coil protection and the high per cent of phase-to-phase faults developing from ground faults, considerable damage was caused to insulators and conductors. This condition was particularly true near the Cedar Rapids generating station, where the major portion of the generating capacity is located. Due to high short-circuit currents and relatively light conductors numerous conductor burndowns and insulator destruction were sustained. Since the Petersen coils were installed no conductor burndowns have been experienced in the Cedar Rapids district, neither has any insulator destruction due to ground arcs been sustained. In fact, only one case of insulator failure has occurred.

•

Columbus Wiring Bureau Re-Elects Loeb Chairman

A. E. Loeb of the Loeb Electric Co., whose re-election as chairman of the Columbus, Ohio, Adequate Wiring Bureau has just been announced, declares that "there is no doubt that thousands of Columbus residents are more wiring conscious than ever before and are demanding wiring adequacy as a requisite to better living."

P. I. Nagle of the Columbus & Southern Ohio Electric Co. was re-elected secretary of the local bureau.

•

Plans to Refund Debt

Stockholders of Public Service Co. of Indiana have ratified issuance of new bonds for refunding the outstanding funded debt. A total of $38,000,000 of 30-year 3¾ per cent mortgage bonds and $10,000,000 of ten-year serial notes will be issued if approved by the state Public Service Commission.

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JASPER BLACKBURN PRODUCTS CORP.

First, Get the Facts

[*Continued from page 51*]

pany gave the better value as a purveyor of goods and services but was extremely low in public esteem as a neighbor and citizen.

The public relations of a corporation are as susceptible to measurement today as is the public reaction to a breakfast food. There is nothing mysterious about the process, nor is it difficult nor expensive. It is the simple business of combining public relations judgment and experience with modern research technique.

This technique has been so systematized and standardized that by asking tested questions of a scientifically allocated cross-section of people 5,000 answers will come within at least 3 per cent of giving the same answer that would be obtained by a million inquiries in a metropolitan city. The opinion of 120,000,000 people can be just as accurately reflected by questioning 15,000 or 20,000 people who constitute a true cross-section of population. There are a number of reputable organizations adequately equipped to do this work, and to do a statistical analysis of the results in scholarly and usable form.

Proper Questions Needed

The preparation of the questionnaire and the interpretation of the results in terms of a practical public relations program for a specific corporation call for the thinking and planning of the corporation executive most experienced in public relations work. He must be completely objective and intent upon finding the exact truth, no matter how directly it may contradict his own preconception. He must realize that the seemingly simple and direct question is most likely to produce misleading results because the average American has a congenital tendency to be kind and helpful. Frequently three questions must be asked to get a true answer to one. Furthermore, every question must be put to a preliminary field test before it is accepted as a part of the survey. If this procedure is followed there must come out of it the only one and accurate answer as to what are the public relations problems of a corporation and what causes them.

It is simpler to diagnose public relations problems than to cure them. Pertinent suggestions as to the cure are frequently afforded by a separate and relatively simple survey of the attitudes of a small group of opinion leaders in the community. This at least points out some of the forces that can be helpful and others that must be counteracted in winning the understanding and mutual respect of the public.

Since public relations are admittedly more important to public utilities than to most other industries, it would seem logical that the first step in the pursuit of them would be to inquire scientifically as to what the public relations problems are, to evaluate them accurately and to determine their source. Any other procedure is a continuation of the basic public relations error of prescribing without diagnosis.

Sales Compensation With Three Objectives

[*Continued from page 45*]

Remembering that in this whole procedure the salesman is the key man, consider how he will naturally act as a partner of the company and thus assume a real personal responsibility for protecting its friendships and good will.

In the first place, he appreciates the consideration which has given him a salary on which he can count ahead, but at the same time holds forth the prospect of better pay for better work. Such a beginning naturally aligns the company's interests with his own. He can put some heart into good-relations building in the other aspects of his job. That attitude makes his job a simpler one, because his specific performances in making friends of customers and dealers condition the raise in salary he's working toward six months hence.

•

G.E. Pays for New Ideas

Announcement has been made by General Electric Co. that during the first six months of this year a total of $32,570 was paid to employees who submitted new ideas aimed at improving the company's operations. The number of suggestions received this year showed a 25 per cent increase over the first six months of 1938. There were 15,407 new ideas submitted, as against 11,545 a year ago. There was also an increase in the number adopted, with 5,304 accepted, against 4,531 in the first half of 1938.

LETTERS TO THE EDITOR

Surge Testing Scheme for High-Voltage Transformers

To the Editor of ELECTRICAL WORLD:

In your March 11, 1939, issue an article appeared entitled "Trip Surge Generator at Any Wave Point," by John R. Gaston, in which he describes a method of synchronizing a surge with a 60-cycle power current by aid of a synchronizing motor.

The undersigned originated and designed an arrangement of this kind in the year 1933. His mechanism has been in successful operation in the testing laboratories of the Wagner Electric Corporation ever since.

In the interest of the history of the art, and in view of the fact that surge testing of high-voltage transformers has become a very important factor in the transformer industry, it appears advisable to publish in the "Electrical World" the description of the synchronizing equipment referred to above.

H. WEICHSEL,
Consulting Engineer
Wagner Electric Corporation,
St. Louis, Mo.

[ED. NOTE.—Mr. Weichsel's account of the engineering features of his arrangement appears in this issue, on page 72.]

Excellent Ideas in Contest Pictures

To the Editor of ELECTRICAL WORLD:

We were more than ordinarily interested in the photographic section of the June 3 issue of ELECTRICAL WORLD. A few days prior to receiving this issue our own electrical section for the anniversary edition of the *Berkshire Evening Eagle* had gone to press.

The many similarities between the pictures in ELECTRICAL WORLD and the pictures we have used prompt us to send you the inclosed copy of the Business Section. In choosing the themes for the three pages we tried to bring out the three most important phases of our company life and activities.

Had ELECTRICAL WORLD printed these pictures earlier in the year, I am sure we would have made use of several very excellent ideas and so improved our own pictorial efforts.

MISS LORAINE LAWSON,
Home Lighting Director
Pittsfield Electric Company,
Pittsfield, Mass.

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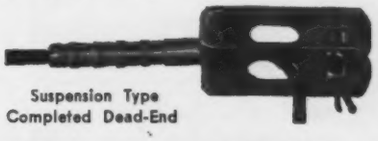

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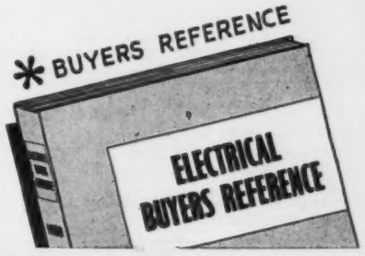

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Sales Opportunities

ALAMEDA, CALIF.—Bureau of Yards and Docks, Navy Department, Washington, D. C., receives bids until September 6 for power plant building at naval air station, Alameda (Specification 8990). Also, until September 20 for equipment for power plant, including boilers and accessories, forced and induced draft fans, combustion control apparatus, air compressors, gasoline engine-driven electric generating unit, piping, supports and complete auxiliary equipment (Specifications 8619).

MCPHERSON, KAN.—City Council receives bids until August 30 for equipment for municipal power plant, including new 5,000-kw. turbo-generator unit and accessories, 7,500-square foot surface condenser and auxiliary apparatus. Cost estimated about $163,000. At later date, bids will be asked for switchgear and other equipment. Burns & McDonnell Engineering Company, 107 West Linwood Boulevard, Kansas City, Mo., is consulting engineer.

PENDER, NEB.—Central States Electric Company, Cedar Rapids, Iowa, plans extensions in primary and secondary lines in parts of Thurston and Dakota counties, vicinity of Pender, totaling close to 40 miles, for expansion in rural electric system, including service facilities. Permission has been granted and work is scheduled to begin soon.

LOUISVILLE, KY.—Buckeye Cotton Oil Company, Floyd and K Streets, plans installation of motors and controls, regulators, conveyors and other equipment in proposed new addition to local mill for solvents production. Cost close to $350,000. Company also will install similar equipment in connection with other expansion at mill, including soy bean division, now in progress, estimated to cost approximately $400,000. Buckeye company is a subsidiary of Procter & Gamble Company, Gwynne Building, Cincinnati, Ohio.

RICHMOND, IND.—Municipal Light and Power Department is arranging an expansion and modernization program at power station, to be carried out during next 36 months, estimated to cost about $920,000. Work will include installation of new turbine-generator unit and accessories, cost about $500,000; boilers and auxiliary equipment, cost close to $220,000; extensions and improvements in power substations and distribution lines, cost about $200,000.

READING, MASS.—Electric Light and Power Department has approved plans for new one-story service, storage and operating building at Haven and High Streets, 60 x 120 feet. Cost about $50,000. Work will be placed under way at once. George H. Sidebottom, 120 Milk Street, Boston, Mass., is architect.

BROOKLYN, N. Y.—Signal Corps Procurement District, Army Base, 58th Street and First Avenue, receives bids until August 30 for quantity of subterranean and other cable, including 22 reels (Circular 37).

MIDLAND, TEX.—Shell Oil Company, Inc., Shell Building, St. Louis, Mo., plans installation of motors and controls, air compressors, conveyors, pumping machinery and other equipment in new gasoline processing plant in vicinity of Midland, where site is being selected. A power house will be built. Cost estimated over $1,000,000. Work is scheduled to begin soon.

LUVERNE, MINN.—City Council plans extensions in municipal power plant, including installation of new generating unit and auxiliary equipment. Estimates of cost are being made.

LAFAYETTE, IND.—Indiana Public Service Company, Indianapolis, Ind., has approved plans for new two-story service and operating building, 42 x 105 feet, for district headquarters, on site at Fourth and Cincinnati Streets, Lafayette. Cost reported over $50,000. Russ & Harrison, Architects' and Builders' Building, Indianapolis, are architects.

MERRILLAN, WIS.—Village Council plans modernization and rebuilding of municipal hydroelectric power plant, including equipment installation. G. L. Van Fleet Company, Dubuque, Iowa, is consulting engineer.

EDGEWOOD, MO. — Chemical Warfare Service, United States Army, Edgewood Arsenal, Edgewood, receives bids until September 5 for two oil-fired boilers, complete with oil burners and burner auxiliary equipment, forced-draft apparatus, connections, instruments, piping, etc.; also for two coal-fired stoker boilers, complete with stokers, forced draft equipment and complete accessories, all for installation in local power plant (Circular 42).

PASADENA, CALIF.—City Board of Directors is considering a report submitted by C. W. Koiner, city manager, recommending expansion in municipal power plant and distributing system to provide for city requirements during next ten years. Cost estimated close to $2,000,000 with turbine-generator units, high-pressure boilers and auxiliary equipment, practically duplicating capacity of present Glenarm station.

EAST MOLINE, ILL.—Peoples Light & Power Company, Moline, has approved plans for expansion and improvements in power substation at East Moline, and will proceed with work at once.

TACOMA, WASH.—City Water Department, W. A. Kunigk, superintendent, plans early call for bids for switchboard and electrical equipment for new pumping station at South 62d and Cedar Streets, South Tacoma. Also for four motor-driven vertical pumping units, each with capacity of 3,500 g.p.m.; two motor-driven deep-well pumping units with combined rating of 8,400 gallons per minute, and complete auxiliary equipment.

FORSYTH, MONT.—City Council is considering preliminary plans for new municipal power plant and will have estimates of cost prepared soon. Also will investigate different types of equipment. F. F. Palmer is city engineer, in charge.

CHICAGO, ILL.—Eastman Kodak Company, Kodak Park, Rochester, N. Y., plans installation of motors and controls, regulators, conveyors and other equipment in new three-story and basement branch plant on Prairie Avenue near Seventeenth Street, Chicago. Bids will be asked soon for erection. Cost about $500,000. Schmidt, Garden and Erickson, 104 South Michigan Avenue, Chicago, are architects.

RUSTON, LA.—City Council plans expansion in municipal power plant and waterworks station, including new building and installation of equipment. Cost estimated about $90,000.

BROWNSVILLE, TENN.—City Council will take bids soon for new power substation, including switchgear and auxiliary equipment. Former bids received have been rejected and revised plans are nearing completion. Freeland, Roberts & Company, Third National Bank Building, Nashville, Tenn., are consulting engineers.

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[*Continued from page 44*]

four, to get an average of 375 kva. per breaker. Assuming the transformer to be loaded to 2,000 kva., the average load per breaker would be only 500 kva. Each circuit has two breakers and two ends, or two sources, of supply; so, doubling the above loads, the feeders would have between 750 and 1,000 kva. each. From a voltage regulation standpoint the circuit could be much more heavily loaded and excellent voltage maintained.

The author is of the opinion that in the heavier suburban load densities—1,500 to 3,000 kva. per square mile—the network transformer should be larger than 1,500 kva., perhaps 2,500 to 3,500 kva., and that the circuits should be more heavily loaded—1,200 to 1,600 kva. per circuit. To avoid the interruption of such a large load in case of trouble, it is recommended that fuses or automatic disconnecting devices be installed at the midpoint of the network feeder to sectionalize the circuit in case of trouble. An automatic circuit breaker installed midway in the circuit would more or less defeat the idea of the plan as it would be too expensive. The author does not know whether fuses, both subway type and overhead type, have been developed capable of carrying 200 to 250 amp. of load without blowing. The development of such an inexpensive fuse to sectionalize a network feeder would be a real development in the medium-voltage network art.

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New England Booklet

A committee of the Engineering Societies of New England, Inc., Boston, has prepared a booklet telling of the works of engineering interest in New England. An invitation has been extended to engineering visitors at the New York World's Fair to visit the New England spots, according to R. W. Horne, chairman of the committee.

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Scholarships in Welding

Two $250 scholarships in welding engineering will be awarded at Ohio State University annually, starting this fall, through the generosity of an alumnus. This alumnus, whose identity is not revealed, has provided several thousand dollars to finance the annual awards. Juniors and seniors in the welding engineering curriculum are eligible. Last year Ohio State inaugurated a four-year course in welding engineering.

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Electronic Tube Maker Uses Electric Ovens

Electric ovens are making rapid headway in the manufacture of radio and television tubes. In a representative plant a number of units are employed in drying out the cathode filaments after coating, as well as the coating material prior to its application. Others are used for baking enamel on metallic tubes, the conveyor type of oven coming into favorable attention here as well as the so-called batch type. Another group of ovens is used in the production of large television tubes which must be raised to a temperature of about 900 deg. F. during evacuation. These tubes must be heated uniformly and quickly to this temperature and the oven must be compact and light, so that it may be lifted off the tube, which is fused to the vacuum stand.

In another department mica parts for tube assemblies are loaded in a forced convection oven with time clock control, to enable the oven to be operated during the night hours on off-peak rates. In all instances forced convection electric ovens were selected because they offered the most economical method of heating, together with rapid and uniform processing, eliminating spoilage. The total connected load of the ovens in the above plant is now 760 kw. and these operate on 220-volt, three-phase, 60-cycle energy.

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Sells Electric Ranges

Edison General Electric Appliance Co., Inc., has sold, during the past two years a total of 8,004 electric ranges to the United States Housing Authority for various projects throughout the country, according to George A. Hughes, president.

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Create New PUD

The Hood River County People's Utility District, embracing virtually all of the Hood River Valley, except the city of Hood River, was created last week by proclamation of Oregon Hydro-Electric Commission.

Residents of the rural areas voted at a recent election to create the district, but voters in the city of Hood River opposed. Elimination of the city reduced the district's assessed valuation from $8,699,293 to $6,262,125.

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